Vol. 12, No. 24
December 31, 1987

Energy Research Abstracts

Abstracts 49230-51050

Office of Scientific & Technical Information
UNITED STATES DEPARTMENT OF ENERGY

CURRENT INFORMATION ON ENERGY

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The publications described below and access to ITIS/OARS are available to Department of Energy and contractor components from the Office of Scientific and Technical Information, U. S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37831/Telephone (615) 576-1301; FTS 626-1301.

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A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The annual subscription price for the 24 issues is $146.00 for domestic (North America) subscribers or $182.50 for foreign (outside North America) subscribers. A single issue is $14.00 or $17.50, respectively.

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Energy Meetings (EM)

A monthly listing of conferences, symposia, workshops, etc., pertaining to DOE's programmatic interests. *EM* is available on subscription (use PB87-901500) from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The annual subscription price is $70.00 for domestic subscribers and $140.00 for subscribers outside the North American continent; a single issue is $8.00 and $16.00, respectively.

The following semimonthly bulletins are also available from the National Technical Information Service. The annual subscription rate for one volume (calendar) year (24 issues; no indexes) is $80.00 for domestic (North America) and $160.00 for foreign (outside North America) subscribers; use the identifying order number (PB- No.) when subscribing.

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Buildings Energy Technology (BET)–**PB87-900700.** Technology required for energy conservation in buildings of all types.

Coal-Based Synfuels (CBS)–**PB87-901400.** Conversion of coal into gaseous or liquid fuels.

Coal Combustion and Utilization (CCU)–**PB87-914400.** Coal combustion, including fluidized bed combustion, and direct utilization of coal for power generation, fuel cells, and MHD generators.

Coal Preparation and Pollution Control (CPC)–**PB87-900800.** Coal preparation and cleaning and reducing pollution from its direct combustion.

Direct Energy Conversion (DEC)–**PB87-946600.** Photovoltaics, magnetohydrodynamics, electrohydrodynamics, thermoelectrics, thermionics, and fuel cells.

Energy from Biomass (EFB)–**PB87-900600.** Biomass production, conversion, and utilization for energy.

Geothermal Energy Technology (GET)–**PB87-914700.** Exploration, development, and utilization of geothermal resources.

Heavy-Ion Reactions (HIR)–**PB87-900500.** Heavy-ion ($A > 4$) reactions.

Laser Research (LAR)–**PB87-901100.** Laser research and development, excluding applications.

Nuclear Fuel Cycle (NFC)–**PB87-913400.** Both front and back ends of the nuclear fuel cycle.

Nuclear Reactor Safety (NRS)–**PB87-913500.** Accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures.

Radioactive Waste Management (RWM)–**PB87-902900.** Management aspects of transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers.

Solar Thermal Energy Technology (STT)–**PB87-901200.** Research and development of efficient and reliable solar thermal conversion systems.

Transportation Energy Research (TER)–**PB87-900900.** Energy-efficient advanced automotive propulsion systems and transportation energy conservation.

Unconventional Petroleum (UCP)–**PB87-901300.** Secondary and tertiary recovery of petroleum and oil shales and tar sands.

INTERNATIONAL ENERGY PUBLICATIONS

The Office of Scientific and Technical Information (OSTI) cooperates in the publication of international abstract journals with the following: (1) International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria, for *Atomindex;* (2) International Energy Agency, Biomass Conversion Technical Information Service, Dublin, Ireland, for *Biomass Abstracts;* and (3) International Energy Agency, IEA Coal Research, London, England, for *Coal Abstracts.* In each case, the cognizant foreign agency provides the non-U. S. information to OSTI for inclusion in the Energy Data Base; in turn, OSTI provides the U. S. information for input into the respective journal.

Atomindex

A semimonthly abstract journal providing worldwide coverage of information on nuclear science and technology. *Atomindex* is available by subscription from Bernan Associates UNIPUB, 10033-F King Highway, Lanham, MD 20706. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $355.

Biomass Abstracts

A bimonthly abstract journal with comprehensive coverage of information on the conversion of biomass to energy. *Biomass Abstracts* is available free to DOE components and contractors from OSTI. Non-DOE organizations may obtain *Biomass Abstracts* from Biomass Conversion Technical Information Service, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland, for 60 IR pounds per year for participating countries and 90 IR pounds per year for nonparticipating countries. Make checks payable to the Institute.

Coal Abstracts

A monthly abstract journal providing comprehensive worldwide coverage of information in the field of coal science and technology. *Coal Abstracts* is available to DOE components and contractors from OSTI. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 110 pounds sterling per year.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

The Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, OSTI places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Although the literature of science is emphasized, coverage extends to DOE programmatic, socioeconomic, environmental, legislative/regulatory, energy analysis, and policy-related areas. To accomplish the mission of furnishing centralized support for Departmental elements in managing their scientific and technical information, OSTI builds and maintains computerized data bases and disseminates information via computerized retrieval systems and announcement publications such as abstract journals, bibliographies, and bulletins. Direct access to OSTI's Energy Data Base (EDB) and Nuclear Science Abstracts Data Base (NSA) is available to the U. S. scientific community through commercial on-line retrieval systems. Access to these data bases from outside the United States is available only through formal exchange agreements. The current-year EDB records, DOE Research-In-Progress, and various other specialized DOE data bases are available to DOE offices and contractors and other government agencies through the OSTI Automated Retrieval System (OARS), which is a major component of the Integrated Technical Information System (ITIS). In addition to providing access to the OSTI on-line systems, ITIS serves as a gateway to other government and commercial systems and provides information merging for customized information products. The Office of Scientific and Technical Information has developed systems to record and communicate energy-related research-in-progress information, to track research report deliverables from DOE contractors, to test and make available DOE-funded computer software programs with scientific and management applications, and to produce special publications in support of DOE program offices. To manage DOE's technical information resources effectively, OSTI's program is one of continual development and evaluation of new information products, systems, and technologies.

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Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

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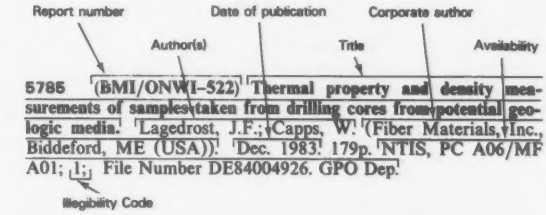
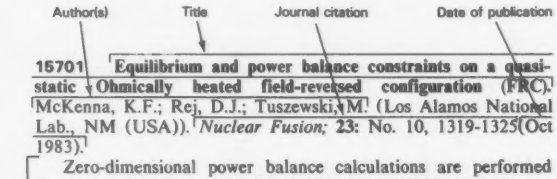
ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Report number
Date of publication
Corporate author
Author(s)
Title
Availability
5785 (BMI/ONWI-522) Thermal property and density measurements of samples taken from drilling cores from potential geologic media. Lagedrost, J.F.; Capps, W. (Fiber Materials, Inc., Biddeford, ME (USA)). Dec. 1983. 179p. NTIS, PC A06/MF A01; 1; File Number DE84004926. GPO Dep.
Illegibility Code

Abstract

Density, steady-state conductivity, enthalpy, specific heat, heat capacity, thermal diffusivity and linear thermal expansion were measured on 59 materials from core drill samples of several geologic media, including rock salt, basalt, and other associated rocks from 7 potential sites for nuclear waste isolation. The measurements were conducted from or near to room temperature up to 500°C, or to lower temperatures if limited by specimen cracking or fracturing. Ample documentation establishes the reliability of the property measurement methods and the accuracy of the results.


Author(s)
Title
Journal citation
Date of publication
15701 Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC). McKenna, K.F.; Rej, D.J.; Tuszewski, M. (Los Alamos National Lab., NM (USA)). Nuclear Fusion; 23: No. 10, 1319-1325 (Oct 1983).

Abstract

Zero-dimensional power balance calculations are performed for a quasi-static, purely Ohmically heated field-reversed configuration. Without compression, the constraint imposed by radial pressure balance limits the power input. Estimates of the energy loss from impurity line radiation as well as from classical and anomalous transport are given. Effects of cold puff gas injection are also investigated.

INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

5785 (BMI/ONWI-522) **Thermal property and density measurements of samples taken from drilling cores from potential geologic media.** Lagedrost, J.F.; Capps, W. **(Fiber Materials, Inc., Biddeford, ME (USA)).** Dec. 1983. 179p. NTIS File Number DE84004926. GPO Dep.

is indexed as:

Fiber Materials, Inc., Biddeford, ME (USA)

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Capps, W., *See* Lagedrost, J. F.
Lagedrost, J.F., Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
McKenna, K.F., Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC), 9:15701 (J;US)
Rej, D.J., *See* McKenna, K.F.
Tuszewski, M., *See* McKenna, K.F.

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

SALT DEPOSITS
Density
Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
REVERSED-FIELD PINCH
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Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC), 9:15701 (J;AT)

• Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

AC06-76RL01830 **Fiber Materials, Inc., Biddeford, ME (USA)** 9:5785 BMI/ONWI-522

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under a File Number, that number is included in the availability statement. A file number–report number correlation is included for convenience.

BMI/ONWI-522 9:5785 NTIS, PC A09/MF A01. File Number DE84004926, Distribution Category MN-70

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Communication concerning the editorial policy and content of *Energy Research Abstracts* should be addressed to the Editor, *Energy Research Abstracts,* Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 289 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R6 from NTIS for $9.50.

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ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

0103 Preparation

REFER ALSO TO CITATION(S) 49254, 49272

49230 (CONF-861063—8) An overview of PETC's [Pittsburgh Energy Technology Center] chemical, physical, and surface-enhanced beneficiation program. Cavallaro, J.A.; Killmeyer, R.P.; Deurbrouck, A.W.; Rhee, K. (USDOE Pittsburgh Energy Technology Center, PA). 1986. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87011808.

From American Society of Metals materials week; Lake Buena Vista, FL, USA (6 Oct 1986).

The US DOE's current Coal Preparation program is directed at the development of advanced coal-cleaning technologies capable of producing super-clean coals that are (1) environmentally acceptable, (2) able to replace gas or oil, and (3) usable in internal combustion engines. Advanced physical coal cleaning technologies under development include heavy-liquid cycloning, electrostatic separation, advanced flotation, and selective agglomeration. One chemical-coal-cleaning technology, Gravimelt, is presently under development. This technology is capable of removing not only the pyritic sulfur but also organic sulfur, as well as the ash-forming mineral matter. However, the CCC processes are considerably more expensive than the physical beneficiation methods. Microbial desulfurization is a new area of coal preparation that appears to have a tremendous potential. By doing research now, these processes may become economically viable by the time more stringent environmental laws are enacted or a shortage of premium fuels (oil and gas) is encountered. This will foster economic growth via increased coal use, improve world stability by reducing reliance upon oil, and improve the quality of life by preserving a clean and healthy environment for future generations. 9 figs., 10 tabs.

49231 (IS—4919) Fossil energy quarterly report, October 1, 1986-December 31, 1986. (Ames Lab., IA (USA)). Mar 1987. Contract W-7405-ENG-82. 83p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000656.

The Quarterly Report of the Fossil Energy Program at the Ames Laboratory describes the research activities for six coal preparation and analysis projects. This work was performed between October 1, 1986, and December 31, 1986. Work on improving mineral liberation through the chemical pretreatment of coal in a stirred ball mill continued. A two-liquid phase separation technique is being applied to the fractionation of ultrafine coal from ash. Initial experiments using a water-isopropyl alcohol-hexane system on an Illinois No. 6 coal containing 35% ash resulted in a concentrate containing less than 6% ash. A new research project investigating the sonic enhancement of physical and chemical cleaning of coal began this quarter. Improvements in ash and sulfur removal were recorded in preliminary tests conducted to measure the effectiveness of applying 10-kHz directed-wave sonication to coal during cleaning by leaching with molten caustic. Current work on the regeneration of alkali used in molten caustic desulfurization of coal addressed the detrimental formation of carbonates during coal cleaning, which then require more steps in the caustic regeneration process. Automated image analysis techniques are being applied to the microcharacterization of coal components in raw and cleaned coals. Efforts are being made to understand better the basic mechanisms and controlling factors by which coal/pyrite separation can occur. Oil agglomeration experiments on various types of coals have shown that the selective coalescence of coal can be controlled by pH, mixing time, and the addition of salts or surface-active reagents.

49232 (IS—4926) Fossil energy quarterly report, January 1, 1987-March 31, 1987. (Ames Lab., IA (USA)). Jun 1987. Contract W-7405-ENG-82. 89p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000658.

This Quarterly Report of the Fossil Energy Program at the Ames Laboratory describes the research activities of six projects in coal preparation and analysis. This work was performed between January 1, 1987, and March 31, 1987. Work in the project aimed to improve mineral liberation and physical beneficiation through the chemical pretreatment of coal in a stirred ball mill focused on establishing baseline conditions for grinding without additives. Controlled-phase fractionation separations of ultrafine coal samples (Illinois No. 6, Pittsburgh No. 8, and Upper Freeport) were performed for each microemulsion region in the hexane-isopropyl alcohol-water system with similar separation results. Efforts to enhance the physical and chemical cleaning of coal through the application of sonic energy concentrated on improving gravity-controlled coal cleaning processes. The best test results to date from the application of 10-kHz direct-wave sonication to Illinois No. 6 seam coal indicate that sonication can improve float yield by 6% while decreasing ash in the float fraction by 10%. Progress made toward the regeneration of alkali in caustic desulfurization systems includes observations that preheating Illinois No. 6, Pittsburgh No. 8, and Kentucky No. 11 coals prior to molten caustic leaching significantly decreased carbonate formation during the chemical cleaning step. Preheating at temperatures of at least 390 to 400°C for 15 minutes or more was necessary for suppressing the formation of carbonates. Automated image analysis is being developed in conjunction with scanning electron microscopy to characterize the association of mineral matter with coal in an effort to evaluate the effectiveness of coal cleaning processes. Investigations into the mechanisms and controlling factors by which coal/pyrite separation can occur continued.

49233 (IS—4927) Regeneration of alkali in caustic desulfurization systems: Fossil Energy quarterly report, April 1, 1987-June 30, 1987. Markuszewski, R.; Chriswell, C.D.; Gollakota, S.V.; Kaushik, S.M.; Norton, G.A.; Shah, N.D. (Ames Lab., IA (USA)). Aug 1987. Contract W-7405-ENG-82. 23p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000659.

Progress was made in the characterization of the volatile matter released from coal during preheating and during molten caustic leaching (MCL) of coal with and without preheating. Total weight loss was higher when coals were preheated and then subjected to MCL than when using MCL only. However, volatile organics released during preheating can be collected and used as a potential fuel. The condensable volatiles contained phenols, hydrocarbons, and water, while the noncondensable gases contained predominantly hydrogen, methane, and other low-molecular weight hydrocarbons. Preheating Illinois No. 6 coal at 455°C for 45 minutes removed about 25% of the total sulfur, including 15% of the pyritic sulfur and 30% of the organic sulfur. However, overall desulfurization by MCL was comparable for the coal with and without preheating. Sulfur was apparently re-incorporated into the MCL-treated coal during washing with H_2SO_4 and could not be readily removed by the usual water washing procedure. However, the sulfur could be effectively removed by extensive rewashing with hot water. The sulfur re-incorporation problem could be alleviated without significantly affecting cleaning efficiency by altering the acid washing procedure. Relatively low carbonate levels were obtained by leaching at 405°C a preheated Pittsburgh No. 8 coal with caustic for 30 minutes (compared to the normal reaction time of 2 hours), but cleaning efficiency decreased significantly. Additional experiments with pyrite and a low-temperature coal ash indicated that reactions of mineral components with caustic occur rap-

idly and at temperatures well below those used in the Gravimelt Process. 6 refs., 7 figs., 8 tabs.

49234 **(IS—4928) Sonic enhancement of physical and chemical cleaning of coal: Fossil energy quarterly report, April 1, 1987-June 30, 1987.** Buttermore, W.H.; Slomka, B.J.; Seward, K.J. (Ames Lab., IA (USA)). Aug 1987. Contract W-7405-ENG-82. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000660.

During this reporting period, additional coal cleaning experiments were performed using the 10-kHz directed-wave sonic apparatus for gravity-controlled processes. Experiments were performed to verify the best test results obtained in self-directed optimization experiments, and a series of tests was performed to reveal the effects of sonic process variables on the quantity and quality of coal recovered. Results indicated that sonication at 10-kHz could consistently improve coal recoveries in gravity-controlled coal cleaning processes. A sonic apparatus was fabricated and assembled for additional chemical coal cleaning experiments using molten caustic. Preparations have begun for the application of directed-wave sonics to surface-controlled coal cleaning processes. Several additional references pertaining to the application of sonic energy for material processing have been obtained and reviewed. 6 refs.

49235 **(IS—4929) Controlled-phase fractionation of ultrafine coal: Fossil Energy quarterly report, April 1, 1987-June 30, 1987.** Burkhart, L.; Birlingmair, D.; Clements, J.; Firth, G.; Pollard, J. (Ames Lab., IA (USA)). Aug 1987. Contract W-7405-ENG-82. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000661.

Accepted float/sink tests, which are based on the differences in specific gravity for coal particles of varying mineral content, are not effective for characterizing ultrafine coal. Experimental work by this laboratory has shown that it is possible to separate finely ground coal into fractions based on the difference in the surface wettability of the carbonaceous and mineral matter. This occurs by causing the particles in a coal sample to be distributed between two immiscible liquid phases, such as an organic-rich phase which preferentially wets the more hydrophobic particles and an aqueous-rich phase which preferentially wets the more hydrophilic particles. The ability of each of the two phases to preferentially wet a coal-ash particle of a given hydrophobicity can be changed by varying the wetting properties of one of the phases in the two-phase system. This can be accomplished by adding a third liquid which is distributed between the two immiscible liquids (for example, adding isopropyl alcohol to a hexane-water system), by using various levels of a surfactant in the system or by using another liquid which is soluble in only one of the two immiscible phases. The results have shown that characterization curves, analogous to the traditional washability curves obtained by float-sink tests, can be prepared for finely ground coal by this technique. 1 ref., 7 figs., 14 tabs.

49236 **(IS—4930) Microcharacterization of coal components: Fossil energy quarterly report, April 1, 1987-June 30, 1987.** Straszheim, W.E.; Markuszewski, R.; Younkin, K.A. (Ames Lab., IA (USA)). Aug 1987. Contract W-7405-ENG-82. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000716.

Testing of coal-mineral association measurements using automated image analysis (AIA) is progressing on samples of minus 30 mesh and minus 200 mesh Illinois No. 6 coal that have been prepared in narrow density and particle size splits. Ash and total sulfur results have been obtained on these samples, and pellets have been prepared for AIA. The AIA results are available for the 200 mesh samples in 5 density fractions, while analyses are still in progress for the 30 mesh samples. Preliminary results indicate that use of the AIA technique may lead to underestimation of the density for low-density particles while estimating the density of high-density particles properly. It was also observed that small mineral particles, though not generally a significant part of the mineral matter content, can be very important in determining the density of composite coal-mineral particles. The AIA density results were used to prepare estimates of coal recovery and mineral matter content as a function of the density of separation. For several of the samples, the predicted mineral matter content agreed well with ASTM and AIA measurements on cleaned samples. If the AIA technique proves reliable, it shows promise as a tool for quickly predicting beneficiation potential. 5 refs., 1 fig., 6 tabs.

49237 **(IS—4931) Chemical pretreatment of coal in a stirred ball mill: Fossil Energy quarterly report, April 1, 1987-June 30, 1987.** Birlingmair, D.; Burkhart, L.; Firth, G.; Pollard, J.; Clements, J. (Ames Lab., IA (USA)). Aug 1987. Contract W-7405-ENG-82. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000662.

Coal was chemically pretreated in a stirred ball mill to demonstrate the effects of pre-conditioning of coal surfaces during comminution to ultrafine sizes prior to separation. The physical cleaning technique chosen for this test was microbubble flotation. The introduction of a collector before or after grinding in alkaline, neutral, or acidic media was compared. Observations made with different grinding times showed that froths with smaller bubbles are more effective in separating finer particle sizes. Limestone was also used as an additive in the stirred ball mill to act both as a grinding aid and as a sulfur scavenger during combustion. The results of simulating combustion under conditions similar to those found in fluidized bed combustors indicated that 50 to 60% of the sulfur in the coal can be reacted and removed with the ash. 5 refs., 4 figs., 9 tabs.

0104 Processing

REFER ALSO TO CITATION(S) 49230, 49233, 49234, 49250

49238 **(DOE/PC/70003—F2) Coal pretreatment for two-stage liquefaction: Final report: Part 2, Temperature-staged coal liquefaction.** Epstein, M.J.; Derbyshire, F.J. (Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering). Apr 1987. Contract FG22-84PC70003. 153p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87011681.

An investigation has been made of the liquefaction of a bituminous and a subbituminous coal under conditions where the reaction is conducted in successive stages of increasing temperature ("temperature staging") and in the presence of a dispersed sulfided molybdenum catalyst. Experiments were conducted in 30 ml batch tubing bomb reactors and in a more sophisticated 300 ml autoclave reactor system which was operated using a coal injector. Temperature staging has been found to lead to increased coal conversion and improved selectivities of the products to oils at the expense of asphaltenes. These effects were less apparent in the autoclave reactor, where the reaction and product work-up was carried out under different conditions from the tubing bomb experiments. Solvent composition, rank, and the presence of the molybdenum catalyst were found to be significant parameters. Specifically, the effects of temperature staging were more pronounced when low quality solvents were employed. In addition, the lower rank subbituminous coal appeared to be more sensitive to temperature staging than the bituminous coal, and the presence of the molybdenum catalyst produced superior product distributions over noncatalytic runs. An examination of the effects of concentrating huminite at the expense of ash and inertinite by float-sink separation of the subbituminous coal indicated that the deleterious effects of processing had offset any gains made by increasing the concentration of reactive macerals. 80 refs., 34 figs., 23 tabs.

49239 **(DOE/PC/80518—T8) Surface chemistry of model Co-Mo catalysts supported on planar γ-Al_2O_3: Annual technical progress report for period September 1, 1986 to August 31, 1987.** Sahin, T.; Ford, W.K. (Montana State Univ., Bozeman (USA)). 1987. Contract FG22-85PC80518. 35p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014935.

Several planar model Co-Mo/Al_2O_3 catalyst samples were prepared and characterized by XPS in calcined, reduced and sulfided states. These catalysts will be used to study the adsorption characteristics of thiophene and cyclohexene in the SIMS/TPD chamber. We have done some preliminary TPD experiments to calibrate the instruments. At the moment the SIMS/TPD system is ready for TPD work. However, the SIMS work had to be delayed due to several hardware failures. In Ford's lab, the oxidation of the

NiAl(110) surface have continued. We summarize some of the results in this report. The future work for the next quarter includes the continuation of the adsorption studies and oxidation characteristics of the (110) aluminum.

49240 (DOE/PC/80907—T7) Reactivity of coal in direct hydrogenation processes: Technical progress report, June-August 1987. Baldwin, R.M.; Miller, R.L. (Colorado School of Mines, Golden (USA). Dept. of Chemical Engineering and Petroleum Refining). 1987. Contract FG22-85PC80907. 31p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000299.

Research focused on completion of all experimental runs on 7 of the 8 coals from the Argonne Premium Coal collection. Data on the conversion of these coals to THF-, toluene-, and hexane-solubles were collected at reaction times of 5 and 40 minutes, and in 5 different vehicles. Naphthalene, 1-methylnaphthalene, and phenanthrene were employed as model aromatic vehicles (solvents), and tetralin and 9,10-dihydrophenanthrene as model hydroaromatic vehicles. The data for relative reactivity of the five bituminous coals tested show complete internal consistency within each of the two solvent classifications. Between solvent groupings (donor vs nondonor), some reactivity shifts are present, thus reinforcing our initial hypothesis concerning solvent effects on reactivity. The reactivity data for the subbituminous and lignite coals tested from the Argonne suite show very strong solvent dependency, and are further confused by the effect of water. The effect of reaction time on reactivity ranking was also explored. These data indicate the importance of considering both reaction statics and dynamics when formulating reactivity definitions. Preliminary correlations utilizing both static and dynamic reactivity definitions were investigated for the coals from the Argonne suite, but these efforts were hampered by a lack of the required data on these coals. All experimental work on the 22 coals from the Penn State Premium coal collection was completed, and data reduction for purposes of reactivity correlation was initiated. 4 refs., 19 figs.

49241 (DOE/PC/90908—T2) Factors controlling hydrogenolysis in coal liquefaction: Quarterly report No. 3 for the period January 1, 1987 to March 31, 1987. McMillen, D.F.; Malhotra, R.; Tse, D.S.; Nigenda, S.E. (SRI International, Menlo Park, CA (USA). Chemical Kinetics Dept.). Sep 1987. Contract FG22-86PC90908. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000390.

In previous DOE-sponsored work, we have shown that even bonds that are too strong to undergo simple thermolysis are nonetheless hydrogenolyzed under coal liquefaction conditions. We have shown that the hydrogenolysis takes place by the transfer of hydrogen atoms to the ipso-positions by solvent-derived radicals (ArH.). Such transfer could take place either by the ArH. species first eliminating a hydrogen atom that then adds to the ipso-position, or in a single bimolecular step. We have termed the latter reaction radical hydrogen-transfer (RHT). Before our investigation, RHT was without precedence in the chemical literature. Subsequently, several studies have appeared in which RHT has been invoked. Further, we have presented data to show that solvent-mediated hydrogenolysis by RHT can better explain the observed order of effectiveness of different solvents than the conventional mechanism of coal liquefaction (i.e., thermolysis followed by radical scavenging). The objective of the present study is to determine in greater detail the factors affecting solvent-mediated hydrogenolyses. This, in turn, will provide a better understanding of, and ability to manipulate, such induced bond-scissions in actual coal liquefaction. To this end, we are investigating the cleavage rates of suitable model compounds in a variety of solvent systems with and without added coals, thereby assessing the relative importance of hydrogenolysis via free H-atoms and via radical hydrogen-transfer (RHT). We have been able to differentiate between hydrogenolysis via free H-atoms from that via RHT by examining the selectivity of cleavage of 1,2′-dinaphthylmethane. To further aid our understanding of the competition in cleavage of strong bonds by various modes of H-transfer, we are also conducting some mechanistic modeling studies. 7 refs.

49242 (DOE/PC/90908—T3) Factors controlling hydrogenolysis in coal liquefaction: Quarterly report No. 4 for the period April 1, 1987 to June 30, 1987. McMillen, D.F.; Malhotra, R.; Tse, D.S.; Nigenda, S.E. (SRI International, Menlo Park, CA (USA). Chemical Kinetics Dept.). Sep 1987. Contract FG22-86PC90908. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000391.

In previous DOE-sponsored work, we have shown that even bonds that are too strong to undergo simple thermolysis are nonetheless hydrogenolyzed under coal liquefaction conditions. We have shown that the hydrogenolysis takes place by the transfer of hydrogen atoms to the ipso-positions by solvent-derived radicals (ArH.). Such transfer could take place either by the ArH. species first eliminating a hydrogen atom that then adds to the ipso-position, or in a single bimolecular step. We have termed the latter reaction radical hydrogen-transfer (RHT). Before our investigation, RHT was without precedence in the chemical literature. Subsequently, several studies have appeared in which RHT has been invoked. Further, we have presented data to show that solvent-mediated hydrogenolysis by RHT can better explain the observed order of effectiveness of different solvents that the conventional mechanism of coal liquefaction (i.e., thermolysis followed by radical scavenging). The objective of the present study is to determine in greater detail the factors affecting solvent-mediated hydrogenolyses. This, in turn, will provide a better understanding of, and ability to manipulate, such induced bond-scissions in actual coal liquefaction. To this end, we are investigating the cleavage rates of suitable model compounds in a variety of solvent systems with and without added coals, thereby assessing the relative importance of hydrogenolysis via free H-atoms and via radical hydrogen-transfer (RHT). We have been able to differentiate between hydrogenolysis via free H-atoms from that via RHT by examining the selectivity of cleavage of 1,2′-dinaphthylmethane. To further aid our understanding of the competition in cleavage of strong bonds by various modes of H-transfer, we are conducting some mechanistic modeling studies. 12 refs.

49243 (DOE/PC/90909—T4) Low severity coal liquefaction using homogeneous basic nitrogen catalysts: Technical progress report, May-July 1987. Miller, R.L.; Baldwin, R.M. (Colorado School of Mines, Golden (USA). Dept. of Chemical Engineering and Petroleum Refining). 1987. Contract FG22-86PC90909. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013718.

This paper reports preliminary results of an exploratory study designed to evaluate the use of homogeneous basic nitrogen compounds for promoting coal dissolution and increasing distillate yields during low severity liquefaction. The project was initiated as a followup to earlier work in our laboratory which suggested that basic nitrogen compound adduction was suppressed at low severity liquefaction conditions compared to conventional high severity conditions. To date, seven carefully selected model nitrogen compounds encompassing a wide range of pK/sub b/ values have been used as coal dissolution promotors. Effects of the following variables on process performance were monitored in these experiments: reaction severity, feed coal rank, and feed gas composition. THF soluble coal conversion data have been correlated as a function of nitrogen compound pK/sub b/ value and results suggest that strongly basic nitrogen compounds are the best coal dissolution promotors at low severity conditions. Dipropylamine and 1,2,3,4-tetrahydroquinoline were identified as being particularly effective, in terms of both promoting coal conversion and resisting irreversible adduction into THF insoluble residual products. 25 refs., 9 figs., 4 tabs.

49244 (DOE/PC/90912—T4) Low severity coal liquefaction to determine reactivity of coals: Technical progress report No. 4 for period March 1, 1987 through May 31, 1987. Chung, K.E. (Rockwell International Corp., Thousand Oaks, CA (USA). Science Center). Aug 1987. Contract FG22-86PC90912. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013630.

The objectives of this investigation are (1) to determine the reactivity of bituminous coals for liquefaction using moderate temperature hydrogenation, and (2) to examine the reaction chemistry

involved in the moderate temperature liquefaction as a function of reaction time, temperature and catalyst application. The experimental work involves hydrogenation of a bituminous coal at 325°C in the absence of a donor solvent and catalyst. Then, the effect of reaction temperature and catalysts will be studied at temperatures between 300 and 350°C using two catalysts, FeS_2 and ammonium molybdate. The effects of reaction time and temperature on the hydrogenation of an Illinois bituminous coal have been reported. Major observations include (1) the high reactivity of the coal with H_2 in the absence of a H-donor solvent at 325°C, conversion being 90% with 14 h reaction time and 69% with 3 h, (2) parallel formation of Oil, Alphaltene and Preasphaltene, (3) separation and identification of aryl-alkyl ethers in product fractions, and the reactivity of the ether groups. In this report, the effects of a hydrogen-donor solvent, 9,10-dihydrophenanthrene (DHP), and pyrite on the hydrogen reaction are presented. An Ohio bituminous coal reacted with H_2 at 325°C similarly to the Illinois bituminous coal. Oil yield was similar to that from the Illinois coal, but the yields of other fractions were significantly different. 2 refs., 1 fig., 3 tabs.

49245 **(PNL-SA—15085) Kinetics and theoretical treatment of primary radical displacement at sulfur.** Franz, J.A.; Ferris, K.F.; Roberts, D.H.; Bartlett, R.J.; Magers, D. (Pacific Northwest Lab., Richland, WA (USA); Florida Univ., Gainesville (USA). Dept. of Chemistry). Jun 1987. Contract AC06-76RL01830. 5p. (CONF-871030—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000085.

From International conference on coal science; Maastricht, Netherlands (26 Oct 1987).

Pathways of formation of carbon-sulfur bonds are of particular importance to coal liquefaction. Intramolecular radical displacement reactions at sulfur may contribute to the formation of the thiophene ring structure and aryl-substituted homologues in competition with pathways involving intramolecular addition of arylthio radicals to nearby aromatic systems. This paper presents results of a kinetic study of intramolecular radical displacement at sulfur and discusses results of an ab initio many-body perturbation theory (MBPT) study of the trimethylsulfuranyl radical, a model for possible intermediate trialkylsulfuranyl radicals in the displacement reactions. Arrhenius expressions for intramolecular displacement of a variety of alkyl groups are discussed in terms of intermediate trialkylsulfuranyl radicals versus simple tricoordinate transition structures. The level of theoretical treatment to obtain accuracy comparable to experiment is evaluated, and theoretical predictions of the energetics and the extent of stereochemical control in radical displacement reactions at sulfur are discussed. 5 refs.

49246 **(PNL-SA—15090) Spectroscopic characterization of Argonne premium coals and short residence time liquefaction products.** Franz, J.A.; Alnajjar, M.S.; Linehan, J.C. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1987. Contract AC06-76RL01830. 8p. (CONF-870802—18). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000092.

From 194. American Chemical Society national meeting; New Orleans, LA, USA (30 Aug 1987).

This paper presents results of a study of liquefaction of five Argonne Premium Coals in tetralin. Illinois No. 6 (high volatile bituminous), Pittsburgh No. 8 (bituminous), Wyoming Subbituminous, Pennsylvania Upper Freeport (medium volatile bituminous) and Pocahontas No. 3 (low volatile bituminous) coals from the Argonne Premium Coal Sample Program were heated in tetralin for 10 minutes at 430 +- 5°C. The products were examined by gel permeation chromatography (GPC) and ^{13}C NMR spectroscopy. Yields for conversion of the coals to tetrahydrofuran-soluble products were determined. Yields and GPC characteristics of products from direct extraction of the coals with THF were determined. The most reactive coal in this group, based on conversion to products below MW 600, appears to be Wyoming subbituminous. 5 refs., 1 fig., 6 tabs.

49247 **Direct use of methane in coal liquefaction.** Sundaram, M.S.; Steinberg, M. (to Dept. of Energy, Washington, DC). US Patent 4,687,570. 18 Aug 1987. Filed date 19 Jun 1985. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A process is described for the liquefaction of carbonaceous materials to produce predominantly liquid hydrocarbons comprising heating the materials in a liquefaction reactor to a temperature in the range of 250°C to 750°C, under pressure up to 6000 psi of a gas containing methane in the initial gas feed at 50-100% by volume for a residence time in the liquefaction reactor of about 20-120 minutes.

49248 **Hydrogen production with coal using a pulverization device.** Paulson, L.E. (to Dept. of Energy). US Patent Application 6-941,130. 12 Dec 1986. 13p. DE88000850 NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000850.

The present invention relates generally to the production of gaseous hydrogen with carbonous materials in the presence of steam by the steam-carbon reaction, and more particularly to such generation of hydrogen by rapidly comminuting coal in the presence of high-temperature steam.

0106 Properties

REFER ALSO TO CITATION(S) 49233, 49236, 49246

49249 **(CONF-870802—17) An EPR [electron paramagnetic resonance] study of nitroxide spin probe doped iIllinois No. 6 coal from the Premium Coal Sample Program: Reactive site distribution.** Kispert, L.D.; Cooray, L.S.; Wuu, Shing K. (Alabama Univ., University (USA). Dept. of Chemistry). 1987. Contract FG22-86PC90502. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012145.

From 194. American Chemical Society national meeting; New Orleans, LA, USA (30 Aug 1987).

Recently, we reported a method to determine the relative pore (accessibility) size and number distribution in selected high-volatile bituminous coal samples by diffusing nitroxide spin probes of different shapes, varying in diameter or length from 0.47 nm to 3.5 nm, into the swellable pores of the coal samples. The relative spin probe concentration was measured by Electron Paramagnetic Resonance (EPR) methods for each sized spin probe. EPR spectra obtained from coal samples containing spin probes gave rise to a spectrum similar to that shown in Figure 1, consisting of an intense central line due to undoped coal (curve B) and, at high gain (curve A), resolved powder EPR lines at high and low magnetic fields due to the z tensor component of the nitrogen hyperfine coupling (A/sub zz/) arising from the nitroxide spin probe dopant. The separation between the high and low field component equals 2A/sub zz/. The relative spin concentrations were determined by integrating the low field peak. The relative spin probe concentration is given in table I for probe I (reacts with amines), probe IV (reacts with acids and phenols), probe V (hydrogen bonding only to the nitroxyl group) and probe VI (hydrogen-bonding to ketone and nitroxyl groups). Notably, the ratio of pores containing acid or phenolic groups to those containing amine groups is 1/3; 6.7/1; 0.5/1; and 12/1 for Mary Lee, Black Creek, Illinois No. 5 and Illinois No. 6 respectively.

49250 **(DOE/PC/80533—T8) Structural characterization/correlation of calorimetric properties of coal fluids: Second annual report, September 1, 1986-August 31, 1987.** Starling, K.E.; Mallinson, R.G.; Li, M.H.; Peters, M.W.; Hulvey, R.D. (Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science). 1987. Contract FG22-85PC80533. 171p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE88000072.

The objective of this research is to examine the relationship between the calorimetric properties of coal fluids and their molecular functional group composition. Coal fluid samples which have had their calorimetric properties measured are characterized using proton NMR, ir, and elemental analysis. These characterizations are then used in a chemical structural model to determine the composition of the coal fluid in terms of the important molecular functional groups. These functional groups are particularly important in determining the intramolecular based properties of a fluid, such as ideal gas heat capacities. Correlational frameworks for ideal gas heat capacities are then examined within an existing equation of state methodology to determine an optimal correlation. The optimal cor-

relation for obtaining the characterization/chemical structure information and the sensitivity of the correlation to the characterization and structural model is examined.

49251 (DOE/PC/90502—4) Catalyst accessibility in high volatile bituminous coal: Quarterly report. Kispert, L.D. (Alabama Univ., University (USA). Dept. of Chemistry). Oct 1987. Contract FG22-86PC90502. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000629.

We are making use of an EPR technique developed in this lab to determine the pore size and number distribution in high volatile bituminous coal using nitroxide spin probes of different sizes, shapes and reactivity. We reported that (1) the reactive site distribution as determined by spin probes measuring approximately 0.6 nm in diameter varies from coal seam to coal seam, (2) the detected acid and phenolic sites in Black Creek Coal (Alabama) and Illinois No. 6 (Argonne Premium Coal Samples Program) exceed the detected amine sites by approximately an order of magnitude, (3) for Mary Lee (Alabama) and Illinois No. 5 (PSOC-699), there are more amine than acid or phenolic sites while Black Creek coal has the greatest number of reactive acid and phenolic sites, and (4) the possibility of a spin probe to be hydrogen bonded in a coal pore was shown not to be an important process for incorporating spin probes in Mary Lee and Black Creek Coal while only a slight factor in samples of Illinois No. 5 (PSOC-699) and Illinois No. 6 (Argonne Premium Coal Program); the number of swellable pores containing spin probes with reactive substituents exceeded those pores containing only hydrogen-bonded spin probes by one to two orders of magnitude. We have begun a study of the number, size, and reactive site distribution for Pittsburgh No. 8 coal from the Argonne Premium Coal Program and PSOC-311 coal (No. 6 seam, Fruitland, New Mexico) from the Penn State Coal Sample Bank. We already have a rather extensive set of spin probe data for Illinois No. 6 coal samples.

49252 (DOE/PC/90519—T3) Electrochemical characterization and derivatization of coal: Technical progress report, September 15, 1986-September 14, 1987. Park, S.M. (New Mexico Univ., Albuquerque (USA). Dept. of Chemistry). 1987. Contract FG22-86PC90519. 23p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014640.

During the first year of this project, we have been carrying out both electrochemical characterization and derivatization of coal by anodic oxidation in an alkaline medium, as originally proposed. These two subprojects are different in nature; the first uses transient electrochemical techniques such as cyclic voltammetry, chronopotentiometry, and pulse polarography including normal pulse and differential pulse polarography, while the second employs exhaustive electrolysis. As a result, different methods of interpretation of results are required. The cyclic voltammetric (CV) technique is difficult to treat theoretically, although it is an excellent method for qualitative purposes. We thus decided to treat the chronopotentiometric experiments theoretically. In this report, we describe results obtained in this area as well as those obtained from the anodic oxidation of coal to produce humic acids. 8 figs., 1 tab.

49253 (DOE/PC/90526—1) Partial oxidation of light alkanes in transition-metal ion containing zeolites: [Quarterly report for the period September 15, 1986-December 14, 1986]. Klier, K.; Lin, J. (Lehigh Univ., Bethlehem, PA (USA). Dept. of Chemistry). 1987. Contract FG22-86PC90526. 13p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000064.

Co(II) A zeolites have been prepared with a cobalt concentration varying from 0.1 to 3.9 cations per unit cell. The optical spectra of the dehydrated samples as well as the linear increase of this peak heights with the cobalt loading showed that all the cations were sitting in equivalent accessible trigonal sites. 6 refs., 3 figs.

49254 (IS—4932) Mechanisms for selective coalescence of coals: Fossil Energy quarterly report, April 1, 1987-June 30, 1987. Wheelock, T.D.; Markuszewski, R.; Fan, C.W.; Venkatadri, R.; Labuschagne, B.C.J.; Tyson, D.; Druding, M. (Ames Lab., IA (USA)). Aug 1987. Contract W-7405-ENG-82. 27p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000663.

Measurement of the zeta potential of fresh Illinois No. 6 coal and similar coal which had been mildly oxidized by exposure to air at room temperature for one week showed only slight differences in the electrokinetic properties of the two materials. However, when the two materials were agglomerated with heptane, the recovery of the oxidized coal was significantly lower than the recovery of the unoxidized coal. On the other hand, the sulfur and ash contents of the product were the same for both materials. The recovery of the unoxidized coal with a small amount of heptane (5 w/w %) was improved significantly by traces of sodium oleate. For pure mineral pyrite, the state of oxidation of the surface was shown to greatly affect both the electrokinetic properties and oil agglomeration characteristics of the material. Various methods of oxidation, including prolonged exposure to air at room temperature, seemed to generate both hydrophilic and hydrophobic oxidation products on the surface of the pyrite. The hydrophilic products were partially removed by hot water and more completely removed by boiling hydrochloric acid, whereas the hydrophobic product was removed by acetone. This evidence suggests that the hydrophilic products included various species such as ferric oxide and ferric sulfate while the hydrophobic product was probably elemental sulfur. The acid-cleaned pyrite responded readily to oil agglomeration whereas the acetone-cleaned pyrite did not. Recovery of the acid-cleaned material was suppressed by adding salt to the agglomeration system, while recovery of oxidized pyrite was greatly enhanced by adding traces of either sodium laurate or sodium palmitate to the system. 4 refs., 13 figs., 4 tabs.

49255 (NMRDI—2-74-4321) Trace element distributions in some New Mexico coals. Kuellmer, F.J.; Kendrick, D.T.; Baker, L. (New Mexico Inst. of Mining and Technology, Socorro (USA)). Apr 1987. 276p. NTIS, PC A13/MF A01 - New Mexico Research and Development Institute, Pion Bldg., Suite 358, 1220 S. St., Francis Dr., Sante Fe, NM 87501. File Number DE88900021.

Coal seams and adjacent rock samples were collected from two drill core sites in the Lee Ranch Mine of the San Juan Basin and from a channel sampling of a recent mine working face in the York Canyon Mine of the Raton Basin, both in New Mexico. Minor and trace elements are not uniformly distributed in a seam but rather occur principally in a U-shaped pattern with the maxima or tails of the U just inside the upper and lower seam boundaries. Any parting within the seam may also act as a seam boundary with a higher element content just above or below. Because the highest trace element content is related to seam boundaries, it is concluded a diagenetic or hydrologic redistribution of trace or minor elements has occurred after deposition in the peat swamp. The peat swamp in some stage of its progression to coal has acted as an ion exchange column which has absorbed the metallic cations available to it from groundwater. The U-shaped heterogeneous distribution of the trace elements suggests physical removal of the top or the bottom of the seam where the trace elements are high may be an economic way to concentrate valuable or troublesome ingredients without having to treat the entire seam. 16 refs., 173 figs., 20 tabs.

49256 Diffuse reflectance infrared Fourier transform (DRIFT) spectroscopic studies of coals: in situ studies of acetylation. Smyrl, N.R.; Fuller E.L. Jr. (Y-12 Plant Laboratory, 9995 MS01, Martin Marietta Energy Systems, Inc., P.O. Box Y, Oak Ridge, Tennessee 37830). *Applied Spectroscopy;* **41**: No. 6, 1023-1027(Aug 1987). Contract AC05-84OR21400.

Diffuse reflectance infrared Fourier transform (DRIFT) spectroscopy has been utilized to monitor the in situ acetylation of a powdered subbituminous coal at the Oak Ridge Y-12 Plant. The acetylation reaction was carried out by the adsorption of acetic anhydride onto the powered coal from the gas phase with subsequent heating above 100 °C required to initiate the reaction. This technique can be used to gain insight into the hydroxyl (O-H) content of the specific coal sample under study by simultaneous observation of the disappearance of infrared absorptions due to various types of O-H functional groups and of the appearance of absorptions due to carbonyl functional groups resulting from reaction with the anhydride. This entire study can be carried out on a single sample without any intervening sample handling or the introduction of extraneous parameters that could alter the results.

0108 Waste Management

REFER ALSO TO CITATION(S) 49522, 49523, 49524, 49889, 49890, 49892, 50194, 50241

49257 **(EPRI-CS—5362-Vol.1) Proceedings: Eighth international ash utilization symposium: Volume 1.** (American Coal Ash Association, Washington, DC; Electric Power Research Inst., Palo Alto, CA (USA)). Oct 1987. 417p. (CONF-8710155—Vol.1). NTIS, PC A18/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303; 1; GPO Dep. File Number DE88000539.

From 8. international ash utilization symposium; Washington, DC, USA (28 Oct 1987).

The two-volume publication contains 65 papers, including six abstracts, presented at ten sessions during the October 1987 event. Some topics covered basic research themes, such as: new studies of fly ash, fly ash concrete, and important properties and construction uses; updated ash sampling and testing procedures; advances in fluidized bed combustion (FBC), flue gas desulfurization (FGD), and other sulfur dioxide control products; and latest pozzolan programs of the Cement and Concrete Reference Laboratory (CCRL) of the National Bureau of Standards. Other topics focused on applied coal ash technology, including: airport, highway and dam construction; structural fills; flowable fill; roller compacted concrete;lightweight building products; recovery of metals from coal ash; fillers for paints and plastics; and new coal ash uses in agriculture and reclamation.

49258 **(EPRI-CS—5362-Vol.2) Proceedings: Eighth international ash utilization symposium: Volume 2.** (American Coal Ash Association, Washington, DC; Electric Power Research Inst., Palo Alto, CA (USA)). Oct 1987. 467p. (CONF-8710155—Vol.2). NTIS, PC A20 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE88000540.

From 8. international ash utilization symposium; Washington, DC, USA (28 Oct 1987).

The two-volume publication contains 65 papers, including six abstracts, presented at ten sessions during the October 1987 event. Some topics covered basic research themes, such as new studies of fly ash, fly ash concrete, and important properties and construction uses; updated ash sampling and testing procedures; advances in fluidized bed combustion (FBC), flue gas desulfurization (FGD), and other sulfur dioxide control products; and latest pozzolan programs of the Cement and Concrete Reference Laboratory (CCRL) of the National Bureau of Standards. Other topics focused on applied coal ash technology including: airport, highway and dam construction; structural fills; flowable fill; roller compacted concrete; lightweight building products; recovery of metals from coal ash; fillers for paints and plastics; and new coal ash uses in agriculture and reclamation.

49259 **Western U.S. coal performance in a pilot-scale fluidized bed combustor.** Zobeck, B.J.; Mann, M.D.; Hajicek, D.R.; Kadrmas, R.J. (UND Energy Research Center, Grand Forks, ND). pp 330-339 of Proceedings of the 1987 international conference on fluidized bed combustion: FBC comes of age. Mustonen, J.P. New York, NY; American Society of Mechanical Engineers (1987). (CONF-870540—).

From 9. international conference on fluidized bed combustion; Boston, MA, USA (3 May 1987).

Four western low-rank coals were evaluated for operability and environmental performance in a 0.46 x 0.46 m bubbling fluid bed combustor operated at atmospheric pressure. Sarpy Creek (Absaloka), Montana subbituminous B; Navajo, New Mexico subbituminous A; South Hallsville, Texas lignite A; and Gibbons Creek, Texas lignite B were tested over a range of conditions: bed temperature (1061, 1116, and 1172 K), gas velocity (0.91, 1.52, and 2.13 m/s) and bed depth (0.64 to 0.88 m). All tests were performed at approximately 20 percent excess air. Initial tests were performed using a silica sand bed to measure the effect of the inherent coal properties on performance. Tests were also performed with limestone addition and/or ash recyle. Limestone for each coal was taken from the same region as the coal.

49260 **Operating experience in a sub-pilot scale pressurized fluidized-bed combustor.** Clisset, H.; Sellakumar, K.M.; Gounder, P.K.; Ganesh, A.; Zakkay, V.; McClung, J.D. (New York Univ., Dept. of Applied Science, Westbury, NY). pp 233-241 of Proceedings of the 1987 international conference on fluidized bed combustion: FBC comes of age. Mustonen, J.P. New York, NY; American Society of Mechanical Engineers (1987). (CONF-870540—).

From 9. international conference on fluidized bed combustion; Boston, MA, USA (3 May 1987).

A sub-pilot scale pressurized fluidized-bed combustion facility, under contract to the U.S. Dept. of Energy, has been in operation using bituminous coal and lignite since 1982. The 760 mm diameter combustor designed and constructed by New York Univ., is well-instrumented, versatile unit for studying in-bed phenomena, and for component and instrumentation development. Previous testing has been carried out to assess operational and environmental performance. Improvements in coal handling, coal feeding, and instrumentation subsystems have increased flexibility and dependability in facility operation and performance. Currently, testing is underway to evaluate the operational performance of three selected particulate control devices: a high-temperature, high-pressure electrostatic precipitator; a ceramic cross-flow filter; and a screenless granular-bed filter. Tests have been carried out at 800-900 kPa and 1172K.

49261 **Results for SO/sub 2/ and NO/sub x/ removal from flue gas by a moving bed of copper oxide.** Stelman, D.; Ampaya, J.P.; Newcomb, J.C. New York, NY; American Institute of Chemical Engineers (1987). 48p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 76F.

A single-stage process for simultaneously removing 90% of the NO/sub x/ and SO/sub 2/ and 99.9% of the particulate material from coal-fired flue gas is reported. The process utilizes a novel contactor/filter with a moving bed of copper oxide absorber-catalyst.

49262 **Advanced environmental control technology for flue gas cleanup.** Pennline, H.W.; Drummond, C.J. New York, NY; American Institute of Chemical Engineers (1987). 15p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 77C.

The U.S. Department of Energy (DOE) oversees a substantial research and development effort to develop advanced environmental control technology for coal-fired sources. This Flue Gas Cleanup Program is currently divided into five areas: combined SO/sub 2//NO/sub x/ control, SO/sub 2/ control, particulate control, NO/sub x/ control, and small-scale boiler emission control. Projects in these areas range from basic research studies to proof-of-concept-scale evaluations. Projects in the DOE program are conducted by universities, national laboratories, industrial organizations, and in-house research at the Pittsburgh Energy Technology Center. An overview of the program, together with brief descriptions of the status of individual projects are given.

49263 **Preliminary results from In-Duct Scrubbing Pilot Study testing.** Samuel, E.A.; Murphy, K.R.; Pennline, H.W. New York, NY; American Institute of Chemical Engineers (1987). 21p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 78B.

A low-cost, moderate-removal-efficiency, flue gas desulfurization (FGD) technology was selected by the Department of Energy for demonstration in its Acid Rain Precursor Control Technology Initiative. The process, identified as In-Duct Scrubbing (IDS), applied rotary atomizer techniques developed for lime-based spray dryer FGD while utilizing existing flue gas ductwork and

particulate collectors. In-Duct Scrubbing technology is anticipated to result in a dry desulfurization process with a moderate removal efficiency (50% or greater) for high-sulfur coal-fired boilers. The critical elements for successful application are (i) adequate mixing of sorbent with the flue gas for efficient reactant contact, (ii) sufficient residence time to produce a non-wetting product, and (iii) appropriate ductwork cross-sectional area to prevent deposition of wet reaction products before particle drying is complete. This paper presents the IDS technology and the status of a jointly sponsored In-Duct Scrubbing Pilot Study that is being tested at the Muskingum River Plant of the American Electric Power System.

49264 **Removal of SO/sub 2/ and NO/sub x/ from stack gas by reaction with calcium hydroxide solids.** Chu, P.; Rochelle, G.T. New York, NY; American Institute of Chemical Engineers (1987). 20p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 78E.

Previous workers have shown that simultaneous SO/sub 2// NO/sub x/ removal can be obtained in a dry scrubbing system with Ca(OH)/sub 2/ promoted by an additive such as NaOH, and that fly ash and product recycle improve the reactivity of the solids toward SO/sub 2/. To test SO/sub 2//NO/sub x/ removal with fly ash and product recycle, bench-scale experiments with a packed bed reactor were performed at bag filter conditions. The most reactive solid for NO/sub x/ removal was prepared by slurrying Ca(OH)/sub 2/ with fly ash, CaSO/sub 3/, and NaOH. The best conditions for NO/sub x/ removal were the highest temperature (125°C) and greatest concentrations of SO/sub 2/ (1500 ppm) and O/sub 2/ (20%). At the best conditions, NO/sub x/ removed in 1 hour was 3 - 4 moles per 100 moles Ca(OH)/sub 2/, compared to 5 - 10 moles SO/sub 2/ removed per 100 moles Ca(OH)/sub 2/. The best SO/sub 2/ removal was obtained at the highest relative humidities/lowest temperatures (55% RH/65°C) with solids prepared by slurrying Ca(OH)/sub 2/ with flyash and NaOH. At these conditions, SO/sub 2/ removed in 1 hour was 60 - 80 moles per 100 moles Ca(OH)/sub 2/, compared to 0.5 to 1 moles NO/sub x/ removed per 100 moles Ca(OH)/sub 2/.

49265 **Simultaneous NO/sub x/ and SO/sub 2/ removal in a spray dryer system.** Huang, H.S.; Farber, P.S.; Livengood, C.D.; Yeh, J.T.; Markussen, J.M. New York, NY; American Institute of Chemical Engineers (1987). 39p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 77E.

The development of environmental control processes for the simultaneous control of nitrogen oxides (NO/sub x/) and sulfur dioxide (SO/sub 2/) emissions is one of the national priorities being pursued by the United States Department of Energy (DOE) under the Flue Gas Cleanup Program. A joint research effort has been constructed by ANL (Argonne National Laboratory) and PETC (Pittsburgh Energy Technology Center) to study the addition of sodium hydroxide (or caustic soda) to aqueous slurries of lime to enhance NO/sub x/ removal in spray-dryer absorber systems. This concept was evaluated in a 4-week field test using the 22-MWe industrial-scale spray-dryer absorber at ANL as well as the process developmental test units at PETC. This paper summarizes the individual findings on caustic addition to a lime-based spray-dryer fabric-filter system from the process development tests in the 0.75-MWe spray-dryer facility at PETC and from the 4-week full-scale industrial tests at the Argonne steam plant.

49266 **Sorbent life cycle testing of the fluidized-bed copper oxide process.** Mc Ardle, J.C.; Leshock, D.G.; Williamson, R.R. New York, NY; American Institute of Chemical Engineers (1987). 16p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 76G.

The Fluidized-Bed Copper Oxide process is a promising new technology being developed to simultaneously remove sulfur dioxide and nitrogen oxide contaminants from the flue gas of coal-fired utility boilers. This dry and regenerable process uses a copper oxide sorbent in a fluidized-bed reactor to remove these contaminants in a relatively simple fashion without generating waste material. The Pittsburgh Energy Technology Center (PETC) of the U.S. Department of Energy has demonstrated the technical and economic feasibility of this process through several stages of bench and pilot plant testing. The PETC sponsored program consists of four phases: Operation of a 160 Nm/sup 3//h (100 SCFM) Life Cycle Test Unit (LCTU), Design and construction of a 5.0 MW Proof-of-Concept unit, Operation of the 5.0 MW Proof-of-Concept unit and Conceptual design and economic evaluation of a 500 MW commercial unit. Results from the operation of the LCTU are presented in this paper.

49267 **The NOXSO process: Simultaneous removal of SO/sub 2/ and NO/sub x/ from flue gas.** Yeh, J.T.; Drummond, C.J.; Haslbeck, J.L.; Neal, L.G. New York, NY; American Institute of Chemical Engineers (1987). 39p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 76E.

The NOXSO process is a dry, regenerable flue gas treatment system that simultaneously removes 90% of the SO/sub 2/ (and SO/sub 3/) and NO/sub x/ from flue gas generated from the combustion of coal. The NOXSO process is wholly owned by NOXSO Corporation, a company formed solely for the purpose of developing the technology. The process has been successfully tested at a small scale on high sulfur coal (2.5%) at TVA's Shawnee Steam Plant. This test facility consisted of a 5.1-cm-diameter, bench-scale fixed-bed reactor and a 20.3-cm-diameter fluidized-bed reactor treating 1.42 actual cubic meters per minute (50 acfm) of flue gas. This scale was equivalent to 1/60 MW/sub e/. The test produced important data on the process chemistry and kinetics, the sorbent physical and chemical life, the sorbent capacity, the performance of various materials of construction, and the efficiency of various reducing gases. The test results are contained in two U.S. Department of Energy (DOE) reports. The results of this small-scale test were sufficiently promising. The process was used to clean flue gas generated by a 227-kg/h (500-lb/hr) pulverized-coal-fire combustor. The results of these NOXSO tests conducted at PETC are summarized in this paper.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 50192, 50240

0110 Reserves And Exploration

49268 **(DOE/PC/91404—T4) Research needs and data acquisition to apply US technology to foreign coals: Annual report, July 1, 1986-June 30, 1987.** Joseph, S.; Kulkarni, A.; Saluja, J. (Viking Systems International, Pittsburgh, PA (USA)). 1987. Contract AC22-86PC91404. 353p. NTIS, PC A16/MF A01; 1; GPO Dep. File Number DE87014904.

Extensive data on the coal resources, characteristics, demand and supply, coal production and plans for coal utilization to meet the energy needs in the countries of the Pacific Basin and Asia have been gathered. Two databases have been prepared based on this information which are compatible with the database on domestic coals available at NCTDC, PETC on coal resources and characteristics. Coal technologies and coal preparation methods currently in use in the Pacific Basin and Asia have also been addressed. In the second phase of this project, an assessment of the information obtained will be conducted and, wherever possible, this data will be compared with domestic data on coals and coal conversion practices so as to highlight similarities or differences. High quality and useful data will be enumerated in the form of graphs, tables and matrices for quick review. Conclusions from this data will depict work areas of potential mutual interest and areas of technology

transfer. US products and services which can be exported will be emphasized.

0120 Mining

REFER ALSO TO CITATION(S) 49268, 49298

49269 (CONF-8511303—, pp 219-238) **Water cooling machines in mining.** Bothe, A. (SABROE Kaeltetechnik G.m.b.H., Dortmund, Germany, F.R. Bereich Bergbaukaelte). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author demonstrates refrigeration technology for applications in mining with special reference to pertinent details and requirements. He presents a special evaporator which allows extremely low outlet temperatures and high volume flows without risk of freezing in the operation of water as the sole fluid.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 49272

49270 (CONF-8708134—2) **Optical instrumentation and study of gas-solid suspension flows.** Ling, S.C.; Pao, H.P. (Catholic Univ. of America, Washington, DC). 1987. Contract FG22-86PC90956. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000147.

From 18. annual meeting of the Fine Particle Society; Boston, MA, USA (3 Aug 1987).

The study of the mechanics of solid-suspension flows is performed by a darkfield optical technique using micro-glass spheres as the suspension solid. The unique specular-reflection characteristic of the glass sphere is utilized for local measurements of the particle size, concentration, and velocity in the flow field. This technique permits one to obtain a more complete knowledge concerning the nature of suspended solid flows. A comprehensive description of both the instrumentation technique and the mechanics of low concentration solid-suspension flow is presented. The recent discovery of the existence of micro-hairpin vortices in the intermediate sublayer-flow may have an important relationship to the transport of solid particles. Figure 7 shows the incipient cavitation of a micro-hairpin vortex into a bubble with twin tails. The head of the hairpin vortex being less strained by the mean shearing flow field has developed into a cavitating bubble a few millimeters in diameter, while the legs are being subjected to a maximum strain rate at the instant the picture was taken. A side view of the tails indicates that they are at 45° with respect to the flow boundary. It is a very fast event which takes place in a fraction of a millisecond. Indeed, it could be the origin of the relatively weak and large vortices that are known to exist in the fully turbulent flow zone. 8 refs., 8 figs.

0140 Combustion

REFER ALSO TO CITATION(S) 49259, 49260

49271 **Corrosion/erosion resulting from the fluidized bed combustion of low-rank coals.** Hajicek, D.R.; Kalmanovitch, D.P.; Mann, M.D.; Kadrmas, R.J. (Univ. of North Dakota Energy Research Center, Grand Forks, ND). pp 663-671 of Proceedings of the 1987 international conference on fluidized bed combustion: FBC comes of age. Mustonen, J.P. New York, NY; American Society of Mechanical Engineers (1987). (CONF-870540—).

From 9. international conference on fluidized bed combustion; Boston, MA, USA (3 May 1987).

A pilot-scale 0.041 m/sup 2/ (0.44 ft/sup 2/) AFBC was designed and constructed specifically to investigate the corrosive and/or erosive properties of low-rank coal combustion on heat transfer surfaces. Horizontal heat transfer tubes are located in the fluidized bed region, the splash zone, and in the convective pass region. Vertically oriented coupons for the purpose of simulating waterwall heat transfer surface are located in the fluidized bed and splash zone. Tubing materials selected for testing included type SA192 carbon steel and types 304, 316, and 347 stainless steels. These materials, along with type 310 stainless steels and Incoloy alloy 800 H, were selected as coupon materials for testing. Surface temperatures of coupon and tubing materials were controlled at specified temperatures by either watercooling, aircooling, or by a lack of cooling. Three tests of 1000 hours duration each were conducted with Sarpy Creek (Absaloka), a Montana subbituminous B coal; South Hallsville, a Texas lignite A coal; and Navajo, a New Mexico subbituminous A coal.

49272 **Coal-water mixture testing in the Grimethorpe PFB Test Facility.** Byam, J.W. Jr.; Wright, S.J. (U.S. Dept. of Energy, Morgantown Energy Technology Center). pp 191-199 of Proceedings of the 1987 international conference on fluidized bed combustion: FBC comes of age. Mustonen, J.P. New York, NY; American Society of Mechanical Engineers (1987). (CONF-870540—).

From 9. international conference on fluidized bed combustion; Boston, MA, USA (3 May 1987).

In the spring of 1986, DOE signed a cooperative agreement with the United Kingdom National Coal Board to test coal-water mixtures (CWM) at the Grimethorpe Pressurized Fluid-Bed Test Facility. A CWM preparation system will be installed in late 1986, and 500 hours of testing on CWM will be accomplished in the PFB during the spring of 1987. The purpose of this paper is to describe the design, construction, and start up of the coal-water mixture preparation and feed system. It will also include testing carried out at the Grimethorpe PFBC Establishment where pumping trials were conducted using solids having a top size in the range of 2 to 3 mm and a range of water contents. Three different types of slurry pumps were tested in the course of the experiments. In addition, initial CWM test results will be discussed as appropriate.

49273 **Market potential for small coal-fired fluidized-bed combustion boilers.** Feibus, H.; Muchunas, P.; Shang, J. (U.S. Dept. of Energy, Office of Fossil Energy, Germantown, MD). pp 55-60 of Proceedings of the 1987 international conference on fluidized bed combustion: FBC comes of age. Mustonen, J.P. New York, NY; American Society of Mechanical Engineers (1987). (CONF-870540—).

From 9. international conference on fluidized bed combustion; Boston, MA, USA (3 May 1987).

A market penetration study revealed that there are three potential markets for small coal-fired fluidized-bed combustion (FBC) boilers: the small industrial organizations, institutional organizations and multi-family installations. In addition to indigenous fuel-fired FBC boilers, the coal-fired FBC boiler or other advanced coal-firing combustors may be able to compete with petroleum-based fuels for boilers for economical and environmentally acceptable long-term operations. Obviously, the large-scale utility plants have already demonstrated the economic viability of the coal-fired FBC boiler for petroleum displacement. The remaining unexplored market is in the small-scale FBC boiler users. It is perceived that there are some restrictions for the lower limits of the coal-fired FBC boilers. This is dictated by a host of economic and technical limitations. Further penetration of the small gas and/or oil markets would require the development of coal-derived fuels and/or advanced combustors.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 49284, 49747

0160 Health And Safety

REFER ALSO TO CITATION(S) 50240

02 PETROLEUM

0202 Geology And Exploration

REFER ALSO TO CITATION(S) 50231, 50232

0203 Drilling And Production

49274 (CONF-871122—1) Oil production in the United States. Reister, D.B. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000577.

From 9. annual IAEE North American conference; Washington, DC, USA (11 Nov 1987).

A preliminary version of Replacement Cost Integration Program (RCIP) provides historical data on drilling footage. The model is less successful at backcasting oil discoveries, finding rate, and oil production. The oil price collapse in 1986 led to a collapse of drilling and concern about oil imports. Representatives of the oil producing states have suggested that the federal government should establish an oil import fee and provide domestic exploration incentives. The analysis reported in this paper suggests that large incentives would be required before drilling footage would return to the 1981 level. In 1981, the domestic price was $40.72 per barrel and at a 3% growth rate, the price would reach $74 in 20 years. In 1987, the prices are $20 per barrel and at a 1% growth rate, the price would reach $24 in 20 years. In 1987, both the current price and the expected price are too low to encourage a high level of drilling.

49275 (CONF-8708142—1) Potential roles for bioprocessing in enhanced oil recovery. Watson, J.S.; Scott, C.D. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014953.

From Symposium on applications of microorganisms to petroleum technology; Bartlesville, OK, USA (12 Aug 1987).

Biotechnology can and is likely to play an important role in many aspects of microbial enhanced oil recovery (MEOR). Most current research is directed at in-situ production of surfactants, polymers, and other materials which can enhance the recovery of oil by altering interfacial properties, water (or oil) viscosity, or bulk flow patterns in the field. The mechanisms of MEOR are still not well understood, and better evaluations of the relative merits of in-situ and surface production of these materials are needed. Great care is needed to insure that field tests of MEOR are planned and executed so they answer specific questions and increase our understanding and predictions of MEOR results. There are also other potential uses of biotechnology in enhanced oil recovery which should be explored. The use of microbial action to reduce environmental problems from release or reinjection of flood waters could become very important if current exemptions of oil recovery operations from environmental regulations are not extended. 11 refs., 1 tab.

49276 (DGMK—295-2) Evaluation of surfactant flooding media, stable to salt, for enhanced oil recovery. Final report. Pusch, G.; Neumann, H.J.; Kraft, H.; Tunc, S. (Deutsche Wissenschaftliche Gesellschaft fuer Erdoel, Erdgas und Kohle e.V., Hamburg (Germany, F.R.); Technische Univ. Clausthal, Clausthal-Zellerfeld (Germany, F.R.). Inst. fuer Tiefbohrtechnik, Erdoel- und Erdgasgewinnung). 1987. 179p. (In German). Deutsche Wissenschaftliche Gesellschaft fuer Erdoel, Erdgas und Kohle e.V., Hamburg, Germany, F.R.

The investigations on the phase behaviour and the results of the flooding experiments with the surfactants employed for DGMK project 295 are compared and interpreted for use as basis for evaluatiig the surfactants for appliability to enanced oil recovery at high salintiy. In this conjunction, the fundamental conclusions concerning the ether carboxylates, documented in the DGMK report, 295-1, are also considered. The surfactants under investigation represent the classes of the ether carboxylates, ether sulfonates, and petroleum sulfonates. Because of their low stability toward salt, the petroleum sulfonates are employed in dual surfactants systems in combination with ether sulfonates stable toward salt, rather than alone. The conclusions derived from the basic investigations of DGMK reports 295-1, 295-3, as well as the analyses for the present report, have resulted in a model condept for the oil recovery process during surfactant flooding with the forming of a middlephase microemulsion. The number of available results from flooding tests with ether carboxylates allows the dependence of the additional oil recovery on the influence exerted on the interfacial tension to be determined by plotting against the capillary number. With 10 refs., 28 figs., 26 tabs.

49277 (DOE/BC—86/4) Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 48, Quarter ending September 30, 1986. (USDOE Bartlesville Project Office, OK). Sep 1987. 125p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87001231.

Progress reports are presented for: (1) chemical flooding (field projects and supporting research); (2) gas displacement (supporting research); (3) thermal methods (supporting research); (4) resource assessment technology; (5) environmental technology; and (5) microbial technology.

49278 (OTH—86-212) Structural assessment of an early southern North Sea platform. Offshore technology report. (Department of Energy, London (UK); Lloyd's Register of Shipping, London (UK). Offshore Services Group). 1986. 42p. H.M. Stationery Office, London.

A report is given on re-evaluation of the fatigue analysis carried out on an offshore North Sea oil platform in 1975 using current techniques. The more sophisticated computer modelling results are presented and discussed in terms of stressed joints and their performance in the fifty year extreme storm.

49279 (PB—87-205449/XAB) Effects of deoxidation practice on the microstructure and properties of microalloyed steel weld metals for offshore applications: progress report (3rd). Kluken, A.O.; Grong, O. (SINTEF, Trondheim (Norway)). 31 Dec 1986. 39p. (STF—34-A87001). NTIS, PC PC E04/MF E04.

See also PB—87-205456.

Preliminary results obtained from CVN testing of ten experimental welds containing varying additions of aluminium, titanium, and boron confirm that the toughness of microalloyed steel weld metals is very sensitive to variations in the deoxidation practice, reflecting the fact that nonmetallic inclusions play a critical role in the development of the acicular ferrite microstructure. At low aluminum levels (0.02-0.03 wt%), both titanium and boron will influence the weld metal properties by enhancing the acicular ferrite formation at the expence of reduced proportions of grain-boundary ferrite in the deposit. Their beneficial effects become, However, weaker with increasing aluminum levels (and above about 0.04 wt% Al, aluminum completely controls the weld-metal microstructure and toughness by promoting extensive intragranular nucleation of acicular ferrite and/or coarse ferrite sideplates. A comparison with relevant literature data shows that this trend is not significantly perturbed by an increase/decrease in other alloying elements such as G, Mn, Si, Mo or Nb.

49280 (PB—87-206827/XAB) North Aleutian Basin transportation methodology. Social and economic studies program technical report Number 102. Final report. (ERE Systems Ltd., Arlington, VA (USA)). Nov 1984. 105p. NTIS, PC A06/MF A01.

See also PB—85-172914.

The principal objective of the report is to develop a methodology to evaluate potential changes in transportation service affected by possible OCS development of the North Aleutian Basin. The

methodology consists of a set of forecasting and analysis procedures with associated assumptions about expected future events or activities, plus recommended standards for certain predetermined conditions. For each transportation mode, the methodology seeks to define and evaluate the incremental difference between conditions likely to occur with OCS activities and the conditions likely to occur with the proposed lease sale.

49281 **Polymerization in supercritical CO/sub 2/ to improve CO/sub 2//oil mobility ratios.** Terry, R.E.; Zaid, A.; Angelos, C.; Whitman, D.L. New York, NY; American Institute of Chemical Engineers (1987). 25p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 48H.

The efficiency of carbon dioxide flooding is hindered by mobility problems resulting from the unfavorable mobility ratio, CO/sub 2// oil. Several approaches were tested in the past to improve CO/sub 2/ flooding efficiency. One approach attempted direct thickening of CO/sub 2/ by dissolving a commercially available polymer in the CO/sub 2/. In this paper a novel idea to increase the CO/sub 2/ viscosity is presented. The increasing of CO/sub 2/ viscosity is attempted by insitu polymerization of monomers miscible with CO/sub 2/. The polymerization is done while the monomer (solute) is in the CO/sub 2/ supercritical phase (solvent). CO/sub 2/ viscosity changes are evaluated by direct measurement using a high pressure Ruska rolling ball viscometer.

0204 Processing

49282 **(NP—7752873) Petroleum - black gold.** (Shell Switzerland, Zurich). Jul 1986. 19p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752873.

This publication describes the processing of petroleum in Switzerland simply and understandably. A table indicates the world petroleum reserves and petroleum consumption in Switzerland. The brochure concludes with a discussion of petrochemistry as the branch of industry that provides basic constituents of a number of commodities.

0206 Health And Safety

49283 **Health effects of diesel exhaust.** McClellan, R.O.; Bice, D.E.; Cuddihy, R.G.; Gillett, N.A.; Henderson, R.F.; Jones, R.K.; Mauderly, J.L.; Pickrell, J.A.; Shami, S.G.; Wolff, R.K. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). pp 597-615 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, P.J. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—). Contract AC04-76EV01013.

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

Diesel exhaust particles are of special concern because of their small size, which makes them readily inhalable and content of known mutagenic and carcinogenic organic chemicals. The potential health effects of these particles have been extensively debated and have been investigated in a number of industrial, government, university and private laboratories; and they are addressed in several reviews and symposia. This report briefly reviews knowledge concerning the potential health effects of inhaled diesel exhaust particles (DEP). It includes a review of the physical and chemical characteristics of DEP, the biological activity of diesel exhaust particle extracts (DEPE) in short-term assays and preliminary results from a long-term study in which rats were chronically exposed to various dilutions of diesel exhaust.

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 49282, 49747

49284 **(DOE/EIA—0035(87/06)) Monthly energy review, June 1987.** (USDOE Energy Information Administration, Washington, DC. Office of Energy Markets and End Use). 28 Sep 1987. 138p. NTIS, PC A07/MF A01 - GPO; 1; GPO Dep. File Number DE88000278.

According to the Energy Information Administration's July 1987 "Short-Term Energy Outlook," US energy consumption for 1987 is projected to reach 75 quadrillion Btu, due to growth in industrial use of natural gas and increased coal-fired and nuclear generation at electric utilities. Prices of imported crude oil delivered to US refiners during the second half of 1987 are projected to stabilize at the official OPEC price of $18 per barrel, assuming that world oil demand increases slowly and that OPEC crude oil production continues to exceed the OPEC production ceiling. Retail motor gasoline prices are projected to rise to $1 per gallon in the third quarter of 1987 and to average $1.02 per gallon during 1988. Domestic crude oil production is projected to decline by 0.4 million barrels per day in 1987 compared with 1986, and net oil imports are projected to rise to 5.6 million barrels per day, the highest level since 1980. Petroleum demand is projected to remain at the 1986 level of 16 million barrels per day.

49285 **(DOE/EIA—0380(87/06)) Petroleum marketing monthly, June 1987.** (USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas). 9 Sep 1987. 168p. NTIS, PC A08/MF A01 - GPO; 1; GPO Dep. File Number DE87014990.

Information and statistical data are given about a variety of crude oils and refined petroleum products, including statistics on crude oil costs and refined petroleum products sales for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase price, the f.o.b. and landed cost of imported crude oil, and the refiners' acquisition cost of crude oil. Sales data for motor gasoline, distillates, residuals, aviation fuels, kerosene, and propane are presented.

49286 **(NP—8900020) The adjustment of US oil demand to the price increases of the 1970's: Have the conservation gains been overstated?.** Gately, D.; Rappoport, P. (New York Univ., NY (USA). Dept. of Economics). Apr 1986. 35p. New York Univ., Dept. of Economics, Washington Square, New York, NY, 10003. File Number TI88900020.

Since the 1979-80 oil price doubling, US oil consumption has declined by about 20%, due to price-induced conservation. US oil consumption will resume its growth and, within five to ten years, will be higher than ever before (assuming oil prices at or below those of 1985). The historic path of US oil consumption and price from 1950-85, and projections of consumptions to the year 2000 show that consumption exceeds its previous peak by 1991; in the "optimistic case, this is delayed until 1996. Combining these results with the consensus projection of declining domestic production, the outlook for rapidly growing dependence on Persian Gulf oil is both clear and disturbing.

0208 Waste Management

REFER ALSO TO CITATION(S) 49264, 49265, 49275, 49288

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 50192, 50207, 50244

49287 (CONF-8703157—1) Emerging environmental constraints on the use of gasoline and diesel fuel and tradeoffs associated with the use of alternative fuels. Singh, M.K.; Saricks, C.L.; LaBelle, S.J.; Moses, D.O. (Argonne National Lab., IL (USA); USDOE Assistant Secretary for Environment, Safety and Health, Washington, DC. Office of Environmental Analysis). 1987. Contract W-31109-ENG-38. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011504.

From Air Pollution Control Association international specialty conference on mobile sources/emerging issues; Windsor, Canada (22 Mar 1987).

In this era of stable to declining oil prices, the economic incentive for turning to alternative fuels for transportation has obviously decreased. Other incentives may lead to the use of alternative transportation fuels. This paper presents preliminary results of a study examining whether an inability of highway vehicles to comply fully with mobile source emission regulations might constrain the use of gasoline and diesel fuels, and thus catalyze penetration of alternative fuels into the transportation market. The study found that while compliance challenges exist, it is unlikely that they alone will force manufacturers to turn to alternative-fueled vehicles. Based on projected household and vehicle characteristics over the next 10 years, a forecast of alternative-fueled vehicle penetration and impact on national emissions has been developed under a set of optimistic but plausible assumptions about future availability and price of alternative fuels. It is estimated that by 1997 under 2% of personal vehicle miles driven could be in methanol-fueled cars and light trucks, the alternative-fueled vehicles most likely to penetrate first. This level of penetration would lead to a reduction of less than 1% in RHC and NO/sub x/ from all transportation sources in 1997.

49288 (K/SUB—85-22224/6) Environmental Assessment Plan: K-1414 area diesel fuel release within the Oak Ridge Gaseous Diffusion Plant. Kuhlmeier, P.D. (Geraghty and Miller, Inc., Oak Ridge, TN (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). Apr 1987. Contract AC05-84OT21400. 53p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87012960.

On February 25, 1987, the Tennessee Department of Health and Environment (TDHE) was notified that a release of No. 2 diesel fuel from an underground storage tank had occurred near the K-1414 garage located within the Oak Ridge Gaseous Diffusion Plant complex. An Environmental Assessment Plan (EAP) discussed the site history, tankage, tank testing results, type and quantity of product released and the initial recovery and containment efforts. Additional to site history, this plan addressed the overall strategy which will be followed to define the extent of free and dissolved phase contaminant plumes in the ground water and soil at the site. This Remedial Action Plan discussed appropriate recovery and treatment methods, and recommended a preferred solution for the site. 13 refs., 19 figs.

49289 (PB—87-207254/XAB) Evaluation of Bering Sea crude oil transportation systems. Social and economic studies program technical report Number 110. Volume 1. Final report. Padron, D.V.; Han, E.H.Y.; Richey, O.P.; Faeth, M.T. (Han-Padron Associates, New York (USA)). Jul 1984. 331p. NTIS, PC A15/MF A01.

See also Volume 2, PB—87-207262.

The purpose of the study is to evaluate and compare the technology and cost associated with crude oil transportation alternatives from the Bering Sea. All relevant parameters were developed for three representative scenarios, based on information in the public domain and the forces exerted on various types of offshore structures were determined based on state-of-the-art procedures. For the base-case parameters of all three scenarios, the optimum crude oil transportation alternative consists of an offshore loading terminal for loading two ice-strengthened tanks. Descriptions of the tankers and support vessels are given.

49290 (PB—87-207262/XAB) Evaluation of Bering Sea crude oil transportation systems: appendices. Social and economic studies program technical report Number 110. Volume 2. Final report. Padron, D.V.; Han, E.H.Y.; Richey, O.P.; Faeth, M.T. (Han-Padron Associates, New York (USA)). Jul 1984. 162p. NTIS, PC A08/MF A01.

See also Volume 1, PB—87-207254.

This report contains the appendices and support documentation for volume I of this study. The purpose of the study is to evaluate and compare the technology and cost associated with crude oil transportation alternatives from the Bering Sea. For the base case parameters of all three scenarios, the optimum crude oil transportation alternative consists of an offshore loading terminal for loading two ice-strengthened tanks. Descriptions of the tankers and support vessels are given.

49291 (PB—87-209649/XAB) Evaluation of environmental information for the Unimak Pass Area, Alaska. Final report. Truett, J.C.; Craig, P.C. (LGL Ecological Research Associates, Inc., Bryan, TX (USA)). Dec 1986. 390p. NTIS, PC A17/MF A01.

This report identifies and describes the important biological resources of the marine environment of the eastern Aleutian Island, Alaska, between 164 and 170°W, and discusses the physical and chemical processes and components that support these resources. It evaluates the potential effects of oil and gas activities on the biota and identifies information needs. It is based solely on a review and analysis of existing information. The eastern Aleutian Islands passes are a major migration corridor between the North Pacific Ocean and the Bering Sea for marine mammals, birds, and some fishes. Plankton is transported into the Bering Sea via island passes.

0220 Transport, Pipelines, And Handling

49292 (OTH—86-231) Development of guidelines for the assessment of submarine pipeline spans - overall summary report. Offshore technology report. Raven, P.W.J. (Department of Energy, London (UK)). 1986. 54p. H.M. Stationery Office, London.

A report is given of the development of improved guidance for assessing spans on submarine pipelines. The work contained laboratory scale testing, full-scale testing of the dynamic response and technical development to establish the analytical tools for span static analysis and the dynamic behaviour.

0230 Properties

REFER ALSO TO CITATION(S) 50400

49293 (INIS-BR—741) Variations of hydrogen and carbon stable isotopes in different types of petroleum. Takaki, T. (Associacao Brasileira de Quimica, Rio de Janeiro). 1986. 1p. (In Portuguese). (CONF-8603206—2-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703493.

From 1. Latin American meeting on mass spectrometry; Rio de Janeiro, RJ, Brazil (20 Mar 1986).

Published in summary form only.

49294 Descriptive accounts of thermodynamic and colloidal models of asphaltene flocculation. Leontaritis, K.J.; Kawanaka, S.; Mansoori, G.A. New York, NY; American Institute of Chemical Engineers (1987). 22p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 20A.

At the present the oil industry, basically, is combating the problem of asphaltene deposition through remedial rather than preventive techniques. Mechanical and chemical cleaning methods are being improvised to maintain production, transportation, and proc-

essing of petroleum at economical levels. There are a number of recent reports that indicate so. The research community, currently, is rather unfamiliar with the reasons and extent of the asphaltene deposition problem. This paper reviews the experiences of the oil industry with asphaltene precipitation and presents justifications and a descriptive account for the development of two different models for asphaltene flocculation. In one of the models the authors consider the asphaltenes to be dissolved in the oil in a true liquid state and dwell upon statistical thermodynamic techniques of multicomponent mixtures to predict their phase behavior. In the other model, they consider asphaltenes to exist in oil in a colloidal state, as minute suspended particles, and utilize colloidal science techniques to predict their colloidal behavior. Experimental work over the last 40 years suggests that asphaltenes possess a wide molecular weight distribution and they exist in both colloidal and dissolved states in the crude oil. Further pursue of the subject in this direction by both the industrial and research communities is warranted.

49295 **Molecular-weight distributions for heavy fossil fuels from gel-permeation chromatography and characterization data.** Rodgers, P.A.; Creagh, A.L.; Prange, M.M.; Prausnitz, J.M. New York, NY; American Institute of Chemical Engineers (1987). 35p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 20B.

A correlation is presented for calculating molecular-weight distributions for high-boiling hydrocarbon mixtures from measurements using gel-permeation chromatography (GPC). The correlation uses GPC elution volume, hydrogen-to-carbon ratio from elemental analysis, and hydrogen distribution from proton-NMR spectroscopy. The procedure is illustrated with results for an Alaskan North-Slope residue.

0240 Storage

REFER ALSO TO CITATION(S) 49287

49296 **(DOE/CE/15303—T1) Feasibility of commercial application of Victor Thayer's innovation for reducing energy required to separate liquids: Summary report.** (Texim Associates, Inc., Friendswood, TX (USA)). Aug 1987. Contract FG01-87CE15303. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000152.

The major goal of this grant is to provide a technical assessment of those factors that contribute to the economic feasibility for the commercial use of the "Low Energy Distillation Process" of Victor Thayer (US Patent No. 4,267,736). The activity had for its purpose the examination of the Thayer process in two separate environments. The first was in using this innovation with a crude oil column; the second, using it with a "clean" service distillation. Given some positive results from either of these applications, a follow-on technical assessment in the commercial community would occur. A preliminary cost analysis with a crude oil column showed a significant advantage in favor of the Thayer method. However, a substantially increased yearly maintenance cost made it economically doubtful for implementation with a crude-oil column. Further analysis substantially verified earlier comments by "Cf-Engineer X". There may, however, be an acceptable application of the Thayer method to smaller scale "clean" service cases with essentially non-fouling fluids. The analysis of the "clean" service distillation suggested that a higher capital and greater maintenance costs than existing technologies would probably result. Hence, the Thayer process was ruled out for revamp applications and considered to be unlikely to be useful in new plants of this type. This study also indicated that there may, indeed, be some specialized duties that favor the use of the Thayer method and that future effort should be directed into identifying applications of this type and into reducing the cost of the heat transfer coils required.

03 NATURAL GAS

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 50231, 50232

0303 Drilling, Production, And Processing

REFER ALSO TO CITATION(S) 49278, 49280

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 49284, 49747

0308 Environmental Aspects

REFER ALSO TO CITATION(S) 49291, 50192

0309 Artificial Stimulation

49297 **(PB—87-222725/XAB) Economic, engineering, and technical support for co-production activities in Louisiana. Final technical report, September 1, 1984-March 31, 1987. Volumes 1 and 2.** (Louisiana State Univ., Baton Rouge (USA)). 31 Jul 1987. 686p. NTIS, PC A99/MF E04.

Conventional production in a water-drive gas reservoir terminates when the producing wells load up with water. This leaves high pressure by-passed gas in the watered-out areas and in the gas cap updip of the watered-out wells. In the proposed co-production process, as the downdip wells begin to water out, they are converted to high-rate water producers while the updip gas wells maintain gas production. Utilization of the co-production process can enhance recovery in three ways. The production of water will lower reservoir pressure and more gas will be produced due to expansion. Water production will slow down the advance of the water front. Also, previous immobile gas in the swept zone might become mobile again as the pressure is lowered. The process is applicable in moderate-to-active water-drive gas reservoirs with the greatest economic potential from those not yet watered-out. The major emphasis of the research was the identification and solicitation of a joint industry and GRI-sponsored Co-Production test site. Industry was introduced to the co-production techniques through direct contacts by the research staff; major oil companies and independent operators in Louisiana and the Gulf Coast Region were presented this enhanced recovery method through in-house presentations and a workshop. Favorable presentations resulted in the screening and analysis of several Louisiana prospects. Detailed analyses were conducted on three (3) reservoirs; of the three, Chevron's Eugene Island Block 305 is considered economically feasible.

49298 **(UCRL—94353) Models of quasi-static and dynamic fluid-driven fracturing in jointed rocks.** Shaffer, R.J.; Heuze, F.E.; Thorpe, R.K.; Ingraffea, A.R.; Nilson, R.H. (Lawrence Livermore National Lab., CA (USA); Cornell Univ., Ithaca, NY (USA); S-Cubed, La Jolla, CA (USA)). Jan 1987. Contract W-7405-ENG-48. 12p. (CONF-870665—6). NTIS MF A01; 2; GPO Dep. File Number DE87008764.

From Society for Experimental Mechanics spring meeting; Houston, TX, USA (14 Jun 1987).

We describe the development and the applications of a numerical model to simulate fluid-driven fracturing in rock masses. It is a finite element computer program which couples solid mechanics, fracture mechanics and fluid mechanics. The fractures are driven either in a quasi-static fashion by conventional hydrofracturing liquids, or in a dynamic fashion by gases from burning solid propellants. Fracture propagation can be arbitrarily modeled in a mixed-mode, in media which already contain discontinuities. The code is applied to the analysis of stimulation of tight gas reservoirs such as the Gas Sands in the Western US and the Coal Beds in Southern US. 16 refs., 15 figs., 3 tabs.

0320 Transport, Pipelines, And Handling

REFER ALSO TO CITATION(S) 49292

49299 (EPRI-EL—5472-CCM-Vol.2) Power line fault current coupling to nearby natural gas pipelines: Volume 2, User's guide for ECCAPP computer program. Dawalibi, F.; Dawalibi, R.; Southey, R.D.; Malric, Y.; Tavcar, W. (Safe Engineering Services and Technologies Ltd., Montreal, Quebec (Canada); Electric Power Research Inst., Palo Alto, CA (USA)). Oct 1987. 147p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920029.

A generalized approach to the analysis of the effects of transmission line faults on natural gas transmission pipelines has been developed and is presented in this report. A state of the art user-friendly computational tool has been developed and verified for the analysis of interference between electrical power lines and nearby buried or above-ground pipelines. This computer program, ECCAPP, is distinguished by its ability to model and analyze accurately complex, realistic interactions between pipelines and power lines, using easily obtained input data. The final report consists of three volumes. An independent fourth volume was also developed to simplify the installation of the ECCAPP software. Volume 1 contains the theory upon which the ECCAPP computer program is based. A parametric analysis and graphical charts have been formulated using ECCAPP to permit estimates to be made in the field or during preliminary analyses for situations that are not too complex. A discussion of various useful mitigation methods is included. The discussion is based on previous research work and on the results of the parametric analysis. Volume 2 is a detailed user's manual which describes not only how to use the program itself, but also which engineering data must be sought during an analysis and how to assimilate it into a computer model. A detailed sample problem is included. A detailed "Glossary of Terms" used by ECCAPP as well as suitable input data forms to be filled by power line and pipeline engineers are provided in the appendices. Volume 3 discusses the modelling and performance of pipeline insulation or coating. 8 figs., 17 tabs.

49300 (TVA/OP/EDT—87/13) Economic evaluation for generating electricity at natural gas pressure regulator stations in the TVA service region. (Engineering Sciences, Inc., Memphis, TN (USA); Tennessee Valley Authority, Chattanooga (USA). Div. of Energy Demonstrations and Technology). Jun 1987. 226p. NTIS, PC A11/MF A01. File Number DE88900012.

The purpose of this study is to investigate the potential of energy recovery from natural gas pressure regulator stations in the Tennessee Valley Authority service region, for the purpose of generating electricity. This required an extensive survey of the natural gas pipelines in the TVA region to identify all of the pressure regulator stations. Once the stations were identified, the economic feasibility of installing an expander to generate electricity was analyzed. The following six system configurations were considered for each site: preheating with natural gas prior to expansion; preheating with high grade waste heat prior to expansion; after heating with low grade waste after expansion; after heating with ground, lake or river water; after heating with ambient air as a heat source; after heating with the refrigeration effect utilized. The final outcome of the feasibility assessment is a list of the sites which have at least one configuration that appears to be technically and economically feasible. For each economical configuration the following information is provided: system configuration; assumptions upon which analysis is based; ownership requirements for feasibility; system simulation output; full economic analysis output. 4 refs., 43 figs., 9 tabs.

0330 Properties

49301 (PB—87-211934/XAB) Application of new conformal solution theories. Annual report, January-December 1986. Erickson, D.D.; Chen, L.J.; Tan, R.; Kwon, Y.J.; Leland, T.W. (Rice Univ., Houston, TX (USA). Dept. of Chemical Engineering). 11 May 1987. 124p. NTIS, PC A06/MF A01.

The report summarizes work carried out at Rice University in 1986. The report contains results which are improvements of this groups earlier work in developing thermodynamic models to predict the properties of liquid and vapor mixtures. The results for this year include: a Monte Carlo simulation of spherocylinders; improvements to the hard-convex-body equation of state; and several nonanalytic equations of state for light hydrocarbons.

0340 Combustion

REFER ALSO TO CITATION(S) 49302

0350 Storage

49302 (CONF-8511303—, pp 203-217) Cryotechnology and its impact on steady natural gas distribution. Grosshans, D. (Technische Werke der Stadt Stuttgart A.G., TWS, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

Liquefaction of natural gas by means of cryotechnological facilities and subsequent storage will have greater significance for steady distribution through the gas transport facilities in future. However, technical equipment might be particularly valuable if these secure sales during both the cold and warm seasons. The application of gas absorption refrigerators of either a conventional design or integrated within cogeneration systems are recommended for summertime operation. Criteria contributing to their profitable operation are given. The application of gas engine heat pumps contributes meaningfully to the application of the primary energy of natural gas. It is recommended to have these systems equipped with more microcomputers to further improve achievable heating numbers.

04 OIL SHALES AND TAR SANDS

0405 Properties And Composition

REFER ALSO TO CITATION(S) 49425

49303 (DOE/FE/60177—2433) Recarbonation of retorted oil shale: The influence on mineralogy and leachate chemistry. Essington, M.E.; Spackman, L.K. (Western Research Inst., Laramie, WY (USA)). Sep 1986. Contract FC21-83FE60177. 150p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE88000386.

The objectives of this study were as follows: Characterize, in detail, the mineralogy of a retored oil shale unaffected by moisture and carbon dioxide; characterize, in detail, the mineralogy of hydrated and recarbonated retorted oil shale; determine the solubility of major, minor, and trace elements in retorted oil shale as a function of hydration and recarbonation and experimental variables (e.g., solid:solution ratio, reaction time, temperature); thermochemically characterize retorted oil shale and hydrated and recarbonated retorted oil shale aqueous extracts to provide an indirect characterization of mineralogy; examine the leaching behavior of chemical constituents as a function of hydration and recarbonation under saturated flow conditions. Detailed mineralogical characterizations were conducted through the use of indirect and direct methods of analysis. Equilibrium solubility experiments were conducted to indirectly characterize and evaluate the mineralogical alterations in retorted oil shale as a function of time, carbon dioxide partial pressure, temperature, and solid:solution ratio. Analytical solution data from these experiments were used as input to a geochemical model to predict trace and minor phase mineralogy. Direct mineralogical characterization was accomplished through x-ray diffraction analysis following the nondestructive preconcentration of mineral phases into distinct physicochemical subfractions. Elemental solubilities as a function of recarbonation were obtained from the equilibrium experiments. Finally, the leaching behavior of trace and major chemical constituents as influenced by hydration and recarbonation was

evaluated using columns packed with retorted oil shale and leached under saturated flow conditions. 38 refs., 34 figs., 26 tabs.

49304 **(DOE/FE/60177—2434) Characterization of oil shale waters by gas chromatography/mass spectrometry.** Lane, D.C.; Baughman, K.J.; Jones, J.S. (Western Research Inst., Laramie, WY (USA)). Sep 1986. Contract FC21-83FE60177. 26p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000911.

Characterization work has begun on organic compounds and compound classes to establish a baseline for the evaluation and development of alternative instrumental characterization techniques. For this purpose raw water from two oil shale processes has been subjected to an extraction and gas chromatography/mass spectrometry (GC/MS) analysis. Samples from the R-17 and Rio Blanco processes were chosen for comparison with previous characterization work reported by Poulson et al. (1984, 1985), who used low-cost gas and reverse-phase liquid chromatographic (LC) techniques. In addition, various inorganic and physical parameters were re-evaluated. The preliminary comparison of GC/MS data with the GC and reverse phase LC data previously reported by Poulson et al., indicates a number of positive correlations for both the process waters. Aliphatic carboxylic acids, cresols, xylenols, methyl pyridines, dimethyl pyridines, and trimethyl pyridines were found both in present GC/MS analysis and in earlier GC and LC analyses of the samples. In addition, trimethylphenols were observed in both the present GC/MS analysis and in the previous GC and LC analyses of the Rio Blanco sample. A number of tentatively identified compounds and compound classes were observed in the GC/MS analysis but were unreported in either the GC or LC analyses for both samples. Similarly, several compounds and compound classes previously reported by GC and LC techniques were absent in the GC/MS analysis. These discrepancies may be attributed to either the original GC and LC research design or to a fundamental chemical change in the samples used for the GC/MS characterization. Additional research is necessary in the areas of extraction design, use of comparable GC and GC/MS marker compounds for identification, standardization of chromatographic columns and GC conditions, and the validity of computer library identifications. 3 refs., 2 figs., 12 tabs.

0409 Waste Research And Management

REFER ALSO TO CITATION(S) 49303

05 NUCLEAR FUELS

0501 Reserves, Exploration, And Mining

REFER ALSO TO CITATION(S) 49363

49305 **(INIS-BR—706) Isotope studies of U (4n+2) and Th (4n) chains in the Morro do Ferro, Pocos de Caldas - Brazil.** Bonotto, D.M. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 1p. (In Portuguese). (CONF-8611184—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703696.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

Published in summary form only.

0504 Feed Processing

REFER ALSO TO CITATION(S) 49334

49306 **(IAEA-TECDOC—420) Advances in uranium refining and conversion. Proceedings of a technical committee meeting held in Vienna, 7-10 April 1986.** (International Atomic Energy Agency, Vienna (Austria)). May 1987. 287p. (CONF-8604358—). NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116.

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

One of the most important steps in the nuclear fuel cycle is the uranium refining and conversion which goes from the yellow cake to three different products: uranium dioxide, natural metallic uranium and uranium hexafluoride. The total volume of this industry, at the present time, is nearly of 40,000 t U per year and at the end of the present century it would have reached the 60,000 t U per year. The refining and conversion of reprocessed uranium that can be extracted by treating irradiated fuel become equally important for recycling recovered fuel. In response to the growing interest in these topics, the IAEA convened a Technical Committee Meeting with the attendance of 37 experts from 21 countries. This technical document contains the 20 papers presented during the meeting. A separate abstract was prepared for each of these papers. Refs, figs and tabs.

49307 (IAEA-TECDOC—420, pp 21-28) **Recent advances and present status of uranium refining in India.** Swaminathan, N.; Rao, S.M.; Sridharan, A.K.; Sampath, M.; Suryanarayanan, V.; Kansal, V.K. (Nuclear Fuel Complex, Hyderabad, India; Bhabha Atomic Research Centre, Bombay, India). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

The present requirement of reactor grade natural uranium-dioxide and metal for power and research reactors are met by indigenous production. The purity of the final product is achieved by solvent extraction process using Tri butyl-phosphate. This involves handling of large quantities of slurry and pulping, filtration and evaporation operations. The calcination and reduction are carried out in rotary furnaces which are more amenable for smaller scale of operations. An extraction unit has been developed for uranium extraction directly from slurries, thus eliminating a number of process steps that are normally involved with the conventional perforated plate pulsed columns. Developmental efforts were also directed towards the studies on recovery of Uranium by Ammonium-Uranyl-Carbonate (AUC) route and calcination of AUC and reduction of UO/sub 3/ (obtained by ADU route) in the fluidized bed reaction systems. This paper brings out the process developments, which have taken place in India in the recent past, that would make the refining operations much more simpler and adoptable for larger scale of operations. 3 refs, 5 figs, 1 tab.

49308 (IAEA-TECDOC—420, pp 29-42) **Operating experience of a pilot plant for the production of uranium dioxide from uranium ore concentrate.** Shabbir, M. (Pakistan Atomic Energy Commission, Islamabad). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Pakistan's heavy-water moderated power reactor (CANDU TYPE) is fuelled with natural uranium dioxide. Chemically pure, compactable and sinterable uranium dioxide powder is required to suit the production of reactor grade fuel pellets. A pilot plant for the production of natural uranium dioxide from the indigenous uranium ore concentrate to meet the CANDU fuel specifications has been established. This paper concerns itself with the operating experiences of the pilot plant. 9 refs, 2 figs, 4 tabs.

49309 (IAEA-TECDOC—420, pp 43-47) **Purification and conversion of uranium from iron and thorium containing deposits.** Movaseghi, H.; Meissami, N. (Atomic Energy Organization of Iran, Teheran). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Acid leaching of uranium deposits is not a selective process. Sulfuric acid solubilizes half or more of the thorium depending on the mineralogy of this element. In uranium recovery by solvent extraction process, uranium is separated from thorium by an organic phase consisting of 10 vol% tributylphosphate (TBP) in kerosin diluent. Provided that the aqueous phase is saturated with ammonium nitrate and pH of the solution is lowered to 0.5 with sulfuric acid.

In other words the separation of uranium and thorium depends on the way that the relative distributions of the two materials between aqueous solutions and TBP vary with sulfuric acid concentration. Under these conditions the extraction of iron(III) into TBP drastically diminishes to a tolerable level. Uranium can be stripped from the organic phase by distilled water, denitrated and delivered for electrolytic reduction. Uranium can be precipitated as uranium tetrafluoride by the reaction between uranous and hydrofluoric acid. Thorium is later recovered from the waste leach liquor after removal of sulfate ions. 5 refs, 1 tab.

49310 (IAEA-TECDOC—420, pp 49-61) **Development of a technology to make UO/sub 2/ starting from "yellowcake" refined with amines in a sulphuric environment.** Vercellone, J.A. (Atomic Energy Commission, Cordoba, Argentina). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

The development carried out at a pilot scale certifies the advantage of purifying "yellow cake" by tertiary amines and to obtain AUTC nuclear purity through direct precipitating elution. Furthermore, this product being adequately conditioned in its mother liquor as well as straightly reduced in a batch furnace by dissociated ammonia produces an UO/sub 2/ free flowing meeting the standard specifications required for nuclear fuel used at Atucha I. The second stage of this technology is in way of being optimized, although sintered densities of 10,40 and 10,60 g/cm/sup 3/ are obtained we are still having problems with the grain growing in the pellets which we are at the present time trying to improve it by adjusting the sintering heat treatment. We want to make acquainted that starting from sulphuric solutions of ore treatment it is possible, with the same technology and without intermediate precipitation, to get an AUTC nuclear purity of same characteristics as the one obtained through the former methodology.

49311 (IAEA-TECDOC—420, pp 63-79) **Status of uranium refining and conversion process technology in Korea.** Chang, I.S.; Hwang, S.T.; Park, J.H. (Korea Advanced Energy Research Inst., Daeduk, Republic of Korea). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

The nuclear grade uranyl nitrate solution is prepared from yellow cake in the purification pilot plant, at Korea Advanced Energy Institute (KAERI), Korea. This pilot plant has several 15 cm diameter pulsed columns which perform a series of extraction, scrubbing and stripping processes in the air pulsation mode. In the pulsed extraction column, the crude uranyl nitrate solution of 2N free-acidity gets in contact counter-currently with the dispersed phase of 40% TBP/dodecane mixture. The uranyl nitrate is then extracted into the organic phase and subsequently reextracted into the aqueous phase to yield a purified uranyl nitrate solution in the stripping column. The final uranyl nitrate solution thus produced is well within a nuclear grade purity and the small uranium content in the raffinate aqueous phase and the stripped organic phase, less than 10 ppm and 100 ppm respectively, shows that all the processes in the plant are satisfactory. Moreover, Mo content of 1500 ppm in the yellow cake is reduced down to less than 1 ppm in the purified uranyl nitrate solution. For the production of sinterable UO/sub 2/ powder, ammonium uranyl carbonate (AUC) is precipitated in the saturated ammonium carbonate solution using nuclear grade uranyl nitrate solution together with ammonia and carbon dioxide gases. The free-flowing and granular type AUC powder is then converted into sinterable UO/sub 2/ powder by reaction with hydrogen gas in a fluidized bed reactor. All parameters, which can control O/U ratio, flowability, tap density, specific surface area, pore size and its distribution, have been studied. 8 refs, 6 figs, 1 tab.

49312 (IAEA-TECDOC—420, pp 81-101) **Research and development of UF/sub 6/ conversion in Japan now and subjects in future.** Hashimoto, Y.; Iwata, I.; Nagasaki, T. (Power Reactor and Nuclear Fuel Development Corp., Tokyo, Japan). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

PNC is engaging in the following research and development: Refining and Conversion Pilot Plant (200TU/Y) which produces UF/sub 6/ from uranium concentrates by the PNC process and UF/sub 6/ conversion of reprocessed uranium (4TU/Y) by dry process. PNC has accumulated many important experiments and has been making many improvements. The following subjects are solved to commercialize the UF/sub 6/ conversion in future: the high costs problem owing to small domestic UF/sub 6/ market and adaption of the most appropriate process for Japan's demand. These subjects will be solved by combining reprocessing, conversion and enrichment facilities at the same site to reduce total fuel cycle cost. 2 refs, 10 figs, 5 tabs.

49313 (IAEA-TECDOC—420, pp 103-110) **Experience in yellowcake refining and its conversion to uranium tetrafluoride at IPEN-CNEN/SP.** Abrao, A. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

This paper will focus the experience acquired during the operation of a pulsed columns solvent extraction pilot plant in the purification of a yellowcake produced from the industrial treatment of monazite sand. Special care was devoted to the rare earth elements, thorium and zirconium decontamination. Intermediate product is an uranium trioxide obtained by dewatering and thermal decomposition of diuranate and its conversion to uranium tetrafluoride. The experience developed and the establishment of the quality control procedures to follow up all steps on both pilot unities as an important support to the technical work is emphasised. 20 refs, 1 fig, 1 tab.

49314 (IAEA-TECDOC—420, pp 111-139) **Conversion of non-nuclear grade feedstock to UF/sub 4/.** Ponelis, A.A.; Slabber, M.N.; Zimmer, C.H.E. (Atomic Energy Corp. of South Africa, Pty Ltd., Pretoria). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

The South African Conversion route is based on the direct feed of ammonium di-uranate produced by any one of a number of different mines. The physical and chemical characteristics of the feedstock can thus vary considerably and influence the conversion rate as well as the final UF/sub 6/ product purity. The UF/sub 4/ conversion reactor is a Moving Bed Reactor (MBR) with countercurrent flow of the reacting gas phases. Initial problems to continuously operate the MBR were mostly concerned with the physical nature of the UO/sub 3/ feed particles. Different approaches to eventually obtain a successful MBR are discussed. Besides obtaining UO/sub 3/ feed particles with certain physical attributes, the chemical impurities also have an effect on the operability of the MBR. The influence of the feedstock variables on the reduction and hydrofluorination rates after calcining has largely been determined from laboratory and pilot studies. The effect of chemical impurities such as sodium and potassium on the sinterability of the reacting particles and therefore the optimum temperature range in the MBR is also discussed. Confirmation of the effect of sodium and potassium impurities on the conversion rate has been obtained from large scale reactor operation. 4 refs, 11 figs, 7 tabs.

49315 (IAEA-TECDOC—420, pp 141-148) **Conversion from uranium tetrafluoride into hexafluoride in a vertical fluorization reactor.** Zhang Zhihua; Chao Lebao. (Bureau of Nuclear Fuels, Beijing, China). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Experiments conducted in a vertical fluorization reactor of 200 mm diameter for converting uranium tetrafluoride or tri-uranium octa-oxide into uranium hexafluoride are reviewed. A brief account of the process flow sheet, major equipments employed and

operations procedures is presented. The advantages of such a reactor are discussed. It is concluded that such a vertical fluorization reactor posesses certain advantages over conventional fluorization equipments. It can be employed not only for the conversion of uranium tetrafluoride into uranium hexafluoride, but also for the direct transposition of tri-uranium octa-oxide into uranium hexafluoride. Even tri-uranium octa-oxide with low concentration of /sup 235/U can be effectively converted into hexafluoride by using this technique. It is hereby claimed that the vertical reactor in question can serve as a commercial fluorization reactor with good adaptability. 1 ref, 2 figs.

49316 (IAEA-TECDOC—420, pp 185-204) **Conversion of uranium ore concentrates and reprocessed uranium to nuclear fuel intermediates at BNFL Springfields. Part A: Uranium ore concentrates.** Page, H. (British Nuclear Fuels plc, Preston, UK. Springfields Works). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Uranium processing has been carried out at the Springfields Works of BNFL for 40 years. During that time some 85,000 t U equivalent of uranium ore concentrate and in excess of 15,000 t U equivalent of uranium recovered from spent fuel reprocessing have been converted to nuclear fuel or nuclear fuel intermediates at Springfields. This paper describes how the conversion facilities have evolved in response to changes in factors such as market demand, feed and product specifications, industrial hygiene and environmental constraints, regulatory practices etc. Comments on the adaptation which will be necessary to deal with anticipated changes in the nuclear fuel cycle are provided. 5 refs.

49317 **(INIS-BR—762) Analysis of the influence of temperature and atmosphere on the reduction process of ammonium and uranyl tricarbonate-AUC.** Riella, H.G.; Lainetti, P.E.O.; Fogaca Filho, N. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 3p. (In Portuguese). (CONF-861299—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703511.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

In this paper, the effect of temperature and atmosphere on the physical and chemical characteristcs of uranium dioxide powder produced from the reduction of AUC have been analysed. The chemical composition and the physical parameters (specific surface area, granulometry and loose density) are directly influenced by the temperature and atmosphere during the reduction of AUC. Uranium dioxide powders produced by direct reduction temperature range 500-800/sup 0/C and by prior, calcination of AUC have been analysed.

49318 **(INIS-BR—765) Flotation in column applied to fines of the Itataia phosphoro-uraniferous ore, CE, Brazil.** Furtado, J.R.V.; Peres, A.E.C. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 7p. (In Portuguese). (CONF-8510463—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703513.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

An adequate process to treat the fine fraction was developed in the present investigation, after size and chemical characterization of the fines. Emphasis was placed on construction, assembling and operation of a 5.2 cm diameter and 6.0 m high continuous flotation column. The column was fed with the pilot plant desliming cyclone overflow, below 10 m. Tests were also carried out with the underflow of the same cyclone and with the very fine underflow of a 20 mm cyclone. The column presented a better performance than a rougher laboratory mechanical cell when tested with the underflow of 20 mm cyclone. Concentrates with 24.5% P_2O_5, with recovery levels above 60% were achieved from feed grades of 10.3%P_2O_5, it is worth mentioning that the rougher flotation reagents scheme is not effective to depress carbonatic gangue irrespective of the size range.

49319 **(INIS-BR—766) Reverse flotation applied to the Itataia (CE) phosphoro-uraniferous ore (Brazil).** Aquino, J.A. de; Furtado, J.R.V. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 10p. (In Portuguese). (CONF-8510463—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703514.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

The studies carried out to develop a process that could selectively separate the apatite and calcite present in the Itataia phosphoro-uraniferous ore body located in the state of Ceara-Brazil are presented. Batch tests were carried out according to two consecutive flotation techniques: direct flotation, whose purposes were the rejection of silicated gangue and also the attainment of a concentrate containing apatite and calcite, followed by a reverse flotation of calcite. Phosphoric acid was used to depress the apatite and fatty acids were used to collect the calcite. From a feed material assaying 15.8% P_2O_5 and 24.4% $CaCO_3$, a concentrate with P_2O_5 and $CaCO_3$ contents of 32.7% and 3.96% respectively, was obtained. Total P_2O_5 recovery was 85.7%.

49320 **(INIS-BR—767) Contribution to the interpretation of flotability characteristics of the calcite/apatite system.** Assis, S.M. de; Silva Maia, G. da; Silva, J. Martins da; Coelho, E.M. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 8p. (In Portuguese). (CONF-8510463—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703515.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

Studies of morphology and determinations of chemical composition of apatite and calcite samples from Jacupiranga, (SP), Brazil, and Itataia (CE), Brazil, were compared with results of microflotation tests. The microflotation tests were carried out with pure and mixture samples. The ores samples were characterized by X-ray diffraction. The behavior of the same ores from other deposits was different from these same ores during microflotation. The flotability of calcite depends on its morphology; the MgO content is a less important variable.

49321 **(INIS-BR—770) Comparison between two sampling methods by results obtained using petrographic techniques, specially developed for minerals of the Itataia uranium phosphate deposit, Ceara, Brazil.** Salas, H.T.; Murta, R.L.L. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 9p. (In Portuguese). (CONF-8510463—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703518.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

The results of comparison of two sampling methods applied to a gallery of the uranium-phosphate ore body of Itataia-Ceara State, Brazil, along 235 metres of mineralized zone, are presented. The results were obtained through petrographic techniques especially developed and applied to both samplings. In the first one hand samples were studied from a systematically sampling made at intervals of 2 metres. After that, the estimated mineralogical composition studies were carried out. Some petrogenetic observations were for the first time verified. The second sampling was made at intervals of 20 metres and 570 tons of ore extracted and distributed in sections and a sample representing each section was studied after crushing at -65. Their mineralogy were quantified and the degree of liberation of apatite calculated. Based on the mineralogical data obtained it was possible to represent both samplings and to make the comparison of the main mineralogical groups (phosphates, carbonates and silicates). In spite of utilizing different methods and methodology and the kind of mineralization, stockwork, being quite irregular, the results were satisfactory.

49322 **(INIS-BR—772) Influence of acid/ore relation in the uranium-silicate ore treatment.** Antaki, C.; Cipriani, M.; Bruno, J.B. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 8p. (In Portuguese). (CONF-8510463—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703520.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

The estimation of acid addition effect (Kg of H_2SO_4/t of ore) in uranium extraction from an uranium-silicate ore, with a

view to the control of silica concentration in leach under 0.6 g/l is presented. The analysis was effected based on bench-scale tests, with different quantities of sulfuric acid addition.

49323 **(INIS-BR—773) Study in pilot plant of the Itataia phosphoro-uraniferous ore (CE,Brazil).** Reis Junior, J.B.; Aquino, J.A. de; Oliveira Luz, I.L. de. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 11p. (In Portuguese). (CONF-8510463—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703521.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

Pilot plant data have been obtained for the physical treatment studies of the Itataia, phosphoro-uraniferous ore body located in the state of Ceara-Brazil. Due to the presence of the silic-carbonated gangue, which turns the ore complex, the pilot plant operation comprised 1200 hours. From the results obtained, it was possible to establish a basic flowsheet for the concentration process. Such process includes a grinding step (-65) followed by a cyclone dasliming (d50 = 10μ). The cyclone underflow feeds the flotation step. The conventional flotation process, which envolves the direct phosphate flotation followed by cleaning steps, was not efficient due to the presence of the carbonated gangue. In fact, the presence of silicates and carbonates in the gangue required that the flotation would be carried out in two steps. The silicated gangue is eliminated in the first flotation and a phosphate concentrate with significant amount of carbonates is obtained. This concentrate is fed to the second flotation step, termed reverse flotation, where the calcite is floated and the apatite is depressed.

49324 **(INIS-BR—774) Oxidizer in phosphoric reactors.** Santos Benedetto, J. dos. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 5p. (In Portuguese). (CONF-8510463—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703522.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

Oxidation during the manufacture of wet-process phosphoric acid affected the distribution of uranium and impurities between phosphoric acid and gypsum, by decreasing the uranium loss to gypsum and the impurities solubilization in phosphoric acid.

49325 **(INIS-BR—775) Uranium reextraction from D_2EHPA-TOPO solvent.** Duarte Neto, J. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 7p. (In Portuguese). (CONF-8510463—11). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703523.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

A comparative study for recovering uranium from the solvent D_2EHPA-TOPO (di-2-ethyl hexyl phosphoric acid - tri-n-octyl phosphine oxide) with ammonium carbonate and sodium carbonate solutions has been made. The paper discusses the precipitation of iron during stripping and the extracctant solubilization in the aqueous phases. Continuous tests showed that uranium is efficiently stripped from the solvent by using both solutions and that the choice of a specific system is dependent on the uranium precipitation mechanism to be employed.

49326 **(INIS-BR—827) Ceramica sphere production by a gel casting.** Santos, A.; Assis, G. de; Ferreira, R.A.N.; Ferraz, W.B.; Lopes, J.A.M.; Prado, M.A.S.; Miranda, O.; Drumond, F.J. (Associacao Brasileira de Ceramica, Sao Paulo). 1987. 12p. (In Portuguese). (CONF-8705175—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703723.

From 31. Brazilian congress on ceramics; Brasilia, DF, Brazil (24 May 1987).

The technology of (Th,U)O/sub 2/ microspheres production by gel casting and subsequente thermal treatment has been transferred from NUKEM GmbH assisted by Kraftwerk Union A.G., both West Germany, to NUCLEBRAS, where it was jointly adapted to produce microspheres suitable for pressing. As a result, there are now available various possibilities to produce ceramic spheres with different characteristics that can be used in different applications. Examples of these characteristics are the range of gel sphere diameters (200 to 5000 μmm) and the value of the specific surface (about 50m/sup 2//g for calcined (Th, U)O/sub 2/ and potentially higher than m/sup 2//g for other ceramic materials)

49327 **(INIS-BR—853) Effect of fine presence in flotation of phosphate from Itataia-Brazil.** Dantas, J.O.C.; Adamian, R. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 16p. (In Portuguese). (CONF-8705182—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703746.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

Some important aspects in the flotation of phosphorus-uraniferous ore from Itataia, Brazil, are presented. The effect of particle size and problems caused by the presence of calcite in the gangue which engages the selectivity of the process are studied. The mineral characterization, grinding tests and flotation tests were done. The Kinetic parameters: maximum extrapolated recovery and kinetic constant were calculated. (M.C.K.).

49328 **(INIS-BR—854) Influence of some ions on the flotation of apatite from Itataia, in Brazil.** Aquino, J.A. de. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 15p. (In Portuguese). (CONF-8705182—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703747.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

The influence of ionic composition in the water from Itataia dam in flotation process for phosphate recovery contained in the ore from Itataia reserve CE, in Brazil, is studied. A water treatment system to assure levels of content and recovery obtained during ore dressing stage is defined. Laboratory tests to verify variation of P/sub 2/O/sub 5/ recovery in function of different ion concentration were done. (M.C.K.).

49329 **(INIS-BR—856) Use of Pourbaix diagrams and the eH and pH measurements in hydrometallurgy. Part 2. Applications.** Teixeira, L.A.C. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 17p. (In Portuguese). (CONF-8705182—4-Pt.2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703749.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

The interpretation of Pourbaix diagrams, presenting as examples; acid lixiviation of uranium ore, iron ion removal from process solutions, lixiviation of copper ores and cyaniding of Au ores containing Cu and Fe is presented. Practical aspects on eH and pH measurement in solutions of hydrometallurgical process. (M.C.K.).

49330 **(INIS-BR—860) Itataia project - development of the process.** Coelho, S.V. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 12p. (In Portuguese). (CONF-8705182—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703752.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

A process for treating the phosphorus uraniferous ore, from Itataia-CE mine in Brazil, was developed, establishing the basic flow chart for recovery of two products: uranium concentrate and phosphoric acid. The developed process consists in physical concentration, chemical separation, solvent extraction, and it presented, in laboratory and pilot scales, recovery levels which assure the project viability technicaly and economicaly. The consolidation of project and the description of installations are presented by a documentary film. (M.C.K.).

49331 **(INIS-BR—861) Alternative processes for uranium recovery from phosphoric acid.** Duarte Neto, J.; Santos Benedetto, J. dos; Aquino, J.A. de. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 13p. (In Portuguese). (CONF-8705182—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703753.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

Two processes of solvent extraction using D/sub 2/ EHPA-TOPO synergistic mixture, in order to recover uranium from phosphoric acid proceeding from physical and chemical treatments of the phosphorus-uraniferous ore of Itataia-CE, Brazil, are studied. The steps of each process were studied in laboratory and pilot scales. The flow charts for both processes with detailed description of each step, the operational conditions, the mass balances, the results obtained and the description of pilot units, are presented. (M.C.K.).

49332 **(INIS-BR—862) Precipitation of uranium concentrates by hydrogen peroxide.** Barbosa Filho, O.; Teixeira, L.A.C. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 23p. (In Portuguese). (CONF-8705182—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703754.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

An experimental study on the precipitation of uranyl peroxide (UO/sub 4/ x H/sub 2/O) has been carried out in a laboratory scale. The objective was to assess the possibility of the peroxide route as an alternative to a conventional ammonium diuranate process. A factorial design was used to evaluate the effects of the initial pH, precipitation pH and H/sub 2/O/sub 2//UO/sub 2//sup 2+/ ratio upon the process. The responses were measured in terms of: efficiency of U precipitation, content of U in the precipitates, and distribution of impurities in the precipitates.

0505 Uranium Enrichment

REFER ALSO TO CITATION(S) 49455

49333 **(Y/TR—87/5) Process and apparatus for separating isotopes by centrifugation.** Gehm, H. (Oak Ridge Y-12 Plant, TN (USA); Gehm (Helmut), Hohenoellen (Germany, F.R.)). 1987. Contract AC05-84OR21400. Translation of German Patent No. 2,020,998, January 7, 1982. 33p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014870.

The invention concerns a process for separating isotopes by centrifugation, in which the isotopes are introduced into the electrode gap of a magnetron diode in the form of an ion gas, and are separated by the effect of the electromagnetic magnetron field. An apparatus for carrying out the process has a vacuum chamber in which there are an inner cylinder electrode and an outer cylinder electrode enclosing it, which are located coaxially to one another, and with their common axis parallel to the field of a magnet, and which enclose a separation chamber bounded in the axial direction, and has also an ion source. An example separating uranium 238 and 235 is given.

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 49306, 49307, 49346, 49458, 49609, 49931

49334 (IAEA-TECDOC—420, pp 9-20) **Refining and conversion of uranium yellowcake to uranium dioxide and uranium hexafluoride fuels in Canada: Current processes.** Ashbrook, A.W. (Eldorado Resources Ltd, Ottawa, Ontario, Canada). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

In Canada, uranium yellowcake is now refined at Blind River and the uranium trioxide produced is shipped 500 km south to Port Hope where it is converted to uranium dioxide and hexafluoride fuels. There have been some significant changes in the processes used in these new plants. Perhaps the most significant is the production of uranium tetrafluoride from uranium trioxide using a "wet" process. In this paper the current processing methods are reviewed, with special emphasis on changes from the previous methods. 5 figs.

49335 (IAEA-TECDOC—420, pp 207-222) **Conversion of uranium ore concentrates and reprocessed uranium to nuclear fuel intermediates at BNFL Springfields. Part B: Reprocessed uranium.** Page, H. (British Nuclear Fuels plc, Preston, UK. Springfields Works). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Some 25,000 t U as UO/sub 3/ have been recovered from irradiated uranium metal fuel (Magnox) since reprocessing began at the Sellafield Works of BNFL more than 30 years ago. More than 15,000 t U equivalent of this reactor depleted uranium have been converted to uranium hexafluoride at Springfields Works. This paper summarises past experience of converting reprocessed uranium to UF/sub 6/ and the changes which will be encountered in the future. 2 refs, 2 figs.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 49306, 49335, 49398, 49453, 49920

49336 **(IAEA-TECDOC—419) Spent fuel management: current status and prospects of the IAEA programme. Proceedings of an advisory group meeting on spent fuel management, held in Vienna, 11-13 March 1986.** (International Atomic Energy Agency, Vienna (Austria)). May 1987. 170p. (CONF-8603158—). NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115.

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

This report, which is a result of the second IAEA Advisory Group Meeting, is intended to provide the reader with an overview of the status of Spent Fuel Management Programmes in a number of leading countries, with a description of the past IAEA activities in this field of Nuclear Fuel Cycle and with the Agency's plans for the next 2-3 years, based on the proposals of Member States. Separate abstracts were prepared for each of the 16 papers in this report. Refs, figs and tabs.

49337 (IAEA-TECDOC—419, pp 11-21) **IAEA spent fuel management programme - past and present.** Sokolov, F. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Fuel Cycle). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

The aim of the IAEA spent fuel management programme is to provide interested Member States with a forum for exchanging information on technical and economic aspects of spent fuel management, including spent fuel storage, transportation, reprocessing and recycling of fissile materials. The paper contains the summary of activities of the IAEA spent fuel management programme in the period 1976-1985, the list of meetings on spent fuel management 1980-1986 and the Agency's programme for 1987-1988.

49338 (IAEA-TECDOC—419, pp 41-55) **New initiatives for international co-operation in the field of spent fuel management: Which projects and why?.** Nechaev, A. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Fuel Cycle). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

In the nearest future (1987-1990) the IAEA plans to initiate a number of new projects in the framework of Spent Fuel Management programme. The used nuclear fuel is a source of essentially non-radioactive fission products valuable for modern technology, namely the platinum group metals rhodium, palladium and ruthenium. The net annual availability of rhodium only from the US power reactor fuels is more than 2000 kg/year. In the 21st century the used nuclear fuel may become the unique source of these important elements. The main aim of the new project is to create a scientific basis for the future technical solutions on this important problem, and to evaluate a real potential of valuable sub-products in used fuel and real industrial demand of these elements. 14 refs, 1 fig, 4 tabs.

49339 (IAEA-TECDOC—419, pp 59-65) **Spent fuel management in Argentina.** Araoz, C.; Mehllich, A.; Montaldo, E. (Comision Nacional de Energia Atomica, Buenos Aires, Argentina). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

The current Argentine nuclear power programme consists of HWR reactors: two in operation (Atucha-I, 345 MWe and EMBALSE, 600 MWe) one 745 MWe is under construction and another one, 700 MWe will be installed before the end of the century. Plans for spent fuel storage and active programme for the utilization of Mixed Oxide (U-235, Pu-239) fuel which allows the development of technology for reprocessing and MOX fuel fabrication on a pilot plant are described. 1 fig, 1 tab.

49340 (IAEA-TECDOC—419, pp 67-71) **Spent fuel management in Belgium.** Collard, G. (Centre d'Etude de l'Energie Nucleaire, Mol, Belgium). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

Belgium currently has 5.5-7 CWe installed capacity with another 1-1,4 CWe planned but not yet committed. The spent fuel is stored at reactor site in storage pools before being sent to a reprocessing plant. The plan for spent fuel reprocessing and recycling of fissile products recovered into thermal and fast breeder reactors and contracts existing with COGEMA for the reprocessing of approximately 600 tonnes U of fuel unloaded from Belgian power plants up to 1989 are outlined.

49341 (IAEA-TECDOC—419, pp 77-95) **Spent fuel management in France.** Guillemard, B. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92, France. Inst. de Recherche Technologique et de Developpement Industriel, IRDI). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

France's programme is best characterized as a closed fuel cycle including reprocessing and use of breeder reactors. It has 38,958 MWe installed capacity with another 21,010 MWe capacity under construction. The chosen spent fuel management scheme is that of reprocessing. National programme and experience on storage, reprocessing and transport of spent nuclear fuel and contracts for reprocessing of spent fuel from different countries are described. 30 refs, 10 figs.

49342 (IAEA-TECDOC—419, pp 97-105) **LWR spent fuel management in the Federal Republic of Germany.** Peehs, M. (Kraftwerk Union A.G., Erlangen, Germany, F.R.). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

The spent fuel management strategy in the Federal Republic of Germany is based on interim storage and subsequent reprocessing of spent fuel. The waste will be disposed of in a geologic repository. In parallel, alternative back-end fuel cycle techniques such as the direct disposal of spent fuel without reprocessing are being investigated and might at a later date be used for the final disposal of spent fuel, which is not suitable for reprocessing. An outline of the national programme on storage, reprocessing and transport of spent fuel and the development and operation of casks for storage and transport are presented. 11 refs.

49343 (IAEA-TECDOC—419, pp 107-123) **Current status of spent fuel management in Japan.** Aratono, Y.; Maeda, M. (Atomic Energy Bureau, Tokyo, Japan; Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

Japan now operates 33 nuclear power reactors with a combined capacity of 24,686 MWe. The future nuclear power generation capacity is forecasted to be about 34 GWe in 1990 and 62 GWe in 2000. The basic nuclear spent fuel management concept is based upon the promotion of fast breeder reactors. Plutonium obtained from spent fuel through reprocessing will be used in FBRs, in advanced thermal reactors and also in LWRs. The reprocessing of spent fuel of LWRs is the chosen spent fuel management scheme selected by Japan. The state of the art and prospects of spent fuel storage, reprocessing in the country and outside, and experience on sea transportation of spent fuel are described. 2 figs, 3 tabs.

49344 (IAEA-TECDOC—419, pp 135-139) **Spent fuel management in Switzerland.** Ospina, C. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen, Switzerland). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

Switzerland currently has 3000 MWe being delivered from five nuclear power plants. Two more 1000 MWe power plants are firmly planned. The current spent fuel management and disposal programme including contracts for reprocessing of all spent fuel generated up to 1990 is presented. The plan for intermediate storage of spent nuclear fuel away from the nuclear power plants, as well as the storage of vitrified high-level wastes is given.

49345 (IAEA-TECDOC—419, pp 153-154) **Recent activities on spent fuel management.** May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

Activity of OECD/NEA in the field of spent fuel management is outlined. Recent studies on economics of the fuel cycle, status report on spent fuel management and study on decommissioning, feasibility, needs and costs are presented. Present activities cover a study on plutonium utilization in different reactors. Contents and goals of the publications prepared by NEA such as reports on projected nuclear fuel cycle requirements (Yellow Book), annual summaries of nuclear power and fuel cycle data (Brown Book) etc. are presented.

49346 (IAEA-TECDOC—420, pp 223-230) **Nitrox process: a process developed by COMURHEX of continuous denitration.** Romano, R. (COMURHEX, Narbonne, France. Malvesi Plant). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

COMURHEX (subsidiary of PECHINEY) has developed since 1982 a process to obtain sinterable oxydes by direct denitration of uranyl nitrate. This process can be used to produce mixed sinterable powder of UO2/PuO2. Some experiments were made and proved the feasibility of the Nitrox process. The paper resumes the advantages of the Nitrox process and gives some experimental details. 1 fig.

49347 (IAEA-TECDOC—420, pp 231-244) **Recent developments in the purification of uranium recovered from irradiated materials.** Regge, P. de; Collard, G.; Daniels, A.; Huys, D.; Sannen, L. (Centre d'Etude de l'Energie Nucleaire, Mol, Belgium). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Experience is reported on the recovery of highly enriched uranium from targets irradiated for the production of isotopes for medical use. The raw material consists of uranates on filter textures, paper tissues and plastic bags. The uranium is leached out by nitric acid; organic material is destroyed by hydrogen peroxide and the filtered solution is fed into a Purex-type extraction cycle. Uranium is extracted with tributylphosphate dissolved in dodecane. The extraction cycle using mixer-settlers consists of eight decontamination stages, eight scrubbing stages and twelve stripping stages. The decontaminated uranium is further handled outside the shielded facility in a glove-box. Using tenoyltrifluoroacetone as an extractant the zirconium, niobium and plutonium quantities still present with the uranium are removed until the final product specifications are reached. The uranium is finally precipitated from a buffered ammonium acetate solution in the form of uranium peroxide, which is filtered off and calcined at 850 deg. C to U/sub 3/O/sub 8/. The final product meets the specifications for recycling into the targets with respect to its residual radioactivity (less than 2600 Bq/g), to its plutonium content (less than 1 ppm) and to its total impurities with a boron equivalent of less than 1 ppm. Presently about 2440 g of uranium have been treated in five campaigns. The chemical yield of the wet chemical operations is around 96 percent including sampling for product characterisations and analyses. 5 refs, 4 figs, 4 tabs.

49348 (IAEA-TECDOC—420, pp 245-253) **Reprocessed uranium conversion: ten years of operation of COMURHEX.** Faron, R. (Societe pour la Conversion de l'Uranium en Metal et Hexafluorure, COMURHEX, 26 - Pierrelatte, France). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

This facility was in the middle of the 1960 pilot plant to convert UF6 to sinterable UO2. In 1970 this plant after some modification was redesigned and provided for the conversion of UNH coming from LWR to UF6. At the end of 1985, 1300 t/U has been converted and delivered to enrichment plants. The reprocessed uranium from light water reactors is slightly enriched 0,9% to 2,25% and contains impurities. During the conversion process COMURHEX has to eliminate not only chemical but radiochemical impurities otherwise the material would never meet the specification for re-enrichment. In this paper the main impurities and decontamination effect of the COMURHEX process are discussed. 3 figs.

49349 (IAEA-TECDOC—420, pp 255-266) **Problems due to impurities in uranium recovered from the reprocessing of used LWR fuel, from the point of view of recycling.** Leyser, E. (Deutsche Gesellschaft fuer Wiederaufarbeitung von Kernbrennstoffen m.b.H., DWK, Hannover, Germany, F.R.). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Specific impurities contained in uranium recovered from reprocessing of used LWR fuel create problems at the diverse stages of the fuel cycle when it is recycled via reenrichment. These impurities are mainly fission products and actinides. They cause either handling problems (radiologic protection of personnel) or technical problems (such as neutron absorption by U/sub 236/). A brief review of the impurities is given together with the problems they create. Product specifications are briefly discussed, and suggestions as to desirable further purification (if it is possible) are made, among them proposed changes of specifications presently being discussed within ASTM. It is most important, if further purification is considered necessary, to find the stage of the cycle where this can be done under the best economical conditions. 3 figs.

49350 (IAEA-TECDOC—420, pp 267-277) **Conversion of reprocessed uranium in Japan.** Yasuda, I.; Miyamoto, Y.; Mochiji, T. (Power Reactor and Nuclear Fuel Development Corp., Tomata, Okayama, Japan. Ningyo-Toge Works). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

In 1981 Power Reactor and Nuclear Fuel Development Corporation (PNC) constructed the Conversion Test Facility-II (CTF-II) in order to develop the conversion process of reprocessed uranium and to obtain the scale-up data and technical know-hows which will be practically applied for the plan of a pilot or a commercial conversion plant in Japan. The facility which converts the reprocessed UO/sub 3/ to UF/sub 6/ has the capacity to convert 4 tons of U per year. The UO/sub 3/ produced by the fluidized-bed denitrator in the reprocessing plant in Tokai Works, PNC, is used as a starting material. The process of the CTF-II consists of mainly UO/sub 3/ hydration, dehydration and reduction, hydrofluorination and F/sub 2/ fluorination sections. The main items researched by the facility are as follows: (1) Investigating the behaviors of the fission products such as Ru and Zr and the transuranic elements such as Pu and Np contained very small amounts in the reprocessed uranium, and separating those elements from uranium. (2) Improving the chemical reactivity of reprocessed uranium prepared by the fluidized-bed denitrator. The facility has converted approximately 5 tons U; besides the following have become clear: (1) The chemical reactivities in reduction, hydrofluorination, and F/sub 2/ fluorination are improved by hydration of UO/sub 3/. (2) Both amounts of F.P and TRU containing in product UF/sub 6/ are less than these in the specification of the uranium enrichment pilot plant in PNC. 2 refs, 5 figs, 3 tabs.

49351 **(INIS-BR—677) ThO/sub 2/ and (Th,U)O/sup 2/ dissolution in solution of nitric acid and hydrofluoric acid.** Lopes, M.J.O.; Filgueiras, S.A.C. (Universidade Estadual de Campinas (Brazil)). 1984. 7p. (In Portuguese). (CONF-8407197—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703437.

From 6. Brazilian congress on chemical engineering; Campinas, SP, Brazil (15 Jul 1984).

The main parameters in the dissolution of the nuclear fuel are analysed. ThO/sub 2/ and (Th,5%U)O/sub 2/ are used as experimental materials and its dissolution behaviour are examined. (C.B).

0509 Transport And Storage

REFER ALSO TO CITATION(S) 49336, 49337, 49339, 49340, 49341, 49344, 49375, 49397, 49398, 49428, 49430

49352 **(CONF-871101—49) Characterization of neutron sources from spent fuel casks.** Parks, C.V.; Pace, J.V. III. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012927.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

In the interim period prior to the acceptance of spent fuel for disposal by the USDOE, utilities are beginning to choose dry cask storage as an alternative to pool re-racking, transshipments, or new pool construction. In addition, the current MRS proposal calls for interim dry storage of consolidated spent fuel in concrete casks. As part of the licensing requirements for these cask storage facilities, calculations are typically necessary to determine the yearly radiation dose received at the site boundary. Unlike wet facilities, neutron skyshine can be an important contribution to the total boundary dose from a dry storage facility. Calculation of the neutron skyshine is in turn heavily dependent on the source characteristics and source model selected for the analysis. This paper presents the basic source characteristics of the spent fuel stored in dry casks and discusses factors that must be considered in evaluating and modeling the radiation sources for the subsequent skyshine calculation. 4 refs., 1 tab.

49353 (IAEA-TECDOC—419, pp 37-39) **Transportation of spent fuel.** Pope, R.B. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Safety). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

The first edition of the IAEA's Regulations for the Safe Transport of Radioactive Materials was published as Safety Series No. 6 in 1961 and revised editions of Safety Series No. 6 were issued in 1964, 1967, 1973, 1979 and 1985. Beginning in 1986, the IAEA will issue a supplement to Safety Series No. 6 every two years. Three major changes in the 1985 edition could affect the transport of spent fuel in the future: release requirement on type B(U) package, deletion of fissile classes and adoption of a 200 m water immersion test for irradiated fuel casks. The next major revision of Safety Series No. 6 is not anticipated until 1995 or later. 2 refs.

49354 (IAEA-TECDOC—419, pp 73-75) **Spent fuel storage in Czechoslovakia.** Machacek, V. (Ceskoslovenska Komise pro Atomovou Energii, Prague). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

Czechoslovakia currently has six WWER-440 reactors operating and six more units at different stages of construction. It is planned that all 12 units will be operational by mid-1990. In accordance with the general bilateral agreement with the USSR on the cooperation in nuclear development, the Soviet Union will accept the return of spent fuel for reprocessing. An outline of cooling pools for spent fuel storage at different time periods is given.

49355 (IAEA-TECDOC—419, pp 149-152) **Spent fuel management in the United States of America.** May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

Spent fuel inventories in the USA exceed 12,000 t HM, and are increasing at a rate in excess of 1300 t per year. In the absence of reprocessing, these inventories are being stored in existing reactor fuel pools. Where initial pool storage capacity was insufficient, and structural and seismic considerations permitted, high density storage racks have been installed to increase pool storage capacity. In addition, a limited amount of spent fuel transshipment has occurred to other reactors within some utility systems where storage space was available. For the next few years there are not reactors in the United States whose continued operation is threatened because spent fuel storage space is not available or otherwise obtainable, using currently viable storage technologies. Future plans for spent fuel management, as established by US law, call for continued utility management of their spent fuel until a Federal repository or Monitored Retrievable Storage Facility (MRS) is established. When one of these Federal facilities becomes available, high-level waste or spent fuel can be transferred to it and become a Federal responsibility. The spent fuel management national programme and progress in this field are presented.

49356 (PNL—6273) **Characteristics of fuel crud and its impact on storage, handling, and shipment of spent fuel.** Hazelton, R.F. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1987. Contract AC06-76RL01830. 56p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000914.

Corrosion products, called "crud," form on out-of-reactor surfaces of nuclear reactor systems and are transported by reactor coolant to the core, where they deposit on external fuel-rod cladding surfaces and are activated by nuclear reactions. After discharge of spent fuel from a reactor, spallation of radioactive crud from the fuel rods could impact wet or dry storage operations, handling (including rod consolidation), and shipping. It is the purpose of this report to review earlier (1970s) and more recent (1980s) literature relating to crud, its characteristics, and any impact it has had on actual operations. Crud characteristics vary from reactor type to reactor type, reactor to reactor, fuel assembly to fuel assembly in a reactor, circumferentially and axially in an assembly, and from cycle to cycle for a specific facility. To characterize crud of pressurized-water (PWRs) and boiling-water reactors (BWRs), published information was reviewed on appearance, chemical composition, areal density and thickness, structure, adhesive strength, particle size, and radioactivity. Information was also collected on experience with crud during spent fuel wet storage, rod consolidation, transportation, and dry storage. From experience with wet storage, rod consolidation, transportation, and dry storage, it appears crud spallation can be managed effectively, posing no significant radiological problems. 44 refs., 11 figs.

49357 (SAND—86-1130) **Testing the half-scale model of the defense high level waste transportation cask.** Madsen, M.M.; Uncapher, W.L.; Stenberg, D.R.; Baynes, E.E. (Sandia National Labs., Albuquerque, NM (USA); Southwest Engineering Associates, El Paso, TX (USA); Geo-Centers, Inc., Albuquerque, NM (USA)). Aug 1987. Contract AC04-76DP00789. 511p. (TTC—0662). NTIS, PC E16/MF A01; 1; GPO Dep. File Number DE87014321.

Large quantities of defense high level waste (DHLW) produced at reprocessing sites of the US Department of Energy (DOE) exist at various locations across the country. In response to the need for a safe and efficient transportation system for this waste, a program was initiated by DOE at Sandia National Laboratories (SNL) in 1979 to design, test, and certify a Type B shipping system. This report presents the results of the testing of the half-scale model of this single containment design. The testing, conducted at Sandia National Laboratories' Coyote Test Facility, included 9 m (30 ft) drop tests and 1 m (40 in.) puncture tests as defined in Title 10 Code of Federal Regulations Part 71. The orientations for the drop tests were: bottom end, closure end [performed at -29°C (-20°F)], side no. 1, center of gravity over bottom corner, and side no. 2. The puncture tests were conducted at two orientations on the cask closure. All instrumentation and dimensional measurement values documented in this report are for the half-scale model. The instrumentation devices used to evaluate the structural response of the cask included accelerometers, strain gages, strain-gaged closure bolts, and linear variable differential transformers. Nondestructive examinations included: leakage testing of the cask closure seals, cavity gas sample port welds, and cask body welds; radiographs of the cask body weldments and depleted uranium shield liner; and dimensional inspections of all components and assemblies. Report contains test data on microfiche. 3 refs.

49358 (SAND—87-0060) **Thermal analysis of the modified Hallum Nuclear Power Facility cask using experimentally obtained thermal boundary conditions corresponding to an engulfing open pool fire.** Longenbaugh, R.S.; Sanchez, L.C.; Gregory, J.J. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1987. Contract AC04-76DP00789. 113p. (TTC—0712). NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87014309.

This report presents the two-dimensional heat transfer analysis of an open pool fire surrounding a modified radioactive materials transport cask. The cask is an older cask that was used by the Hallum Nuclear Power Facility (HNPF). The HNPF cask did not have a neutron shielding region but was modified to include one for testing purposes. Analysis of the thermal effects of an engulfing open pool fire was performed with the use of the heat transfer code Q/TRAN, which had previously been used in thermal benchmarking problems for spent nuclear fuel casks. Boundary condition data for the analysis were derived from experimental open pool fire tests of large-scale calorimeter test articles performed at SNL that produced information about cask surface heat flux versus surface temperature relationships. Data analysis was directed toward a determination of the thermal response of the cask, particularly the extent of lead melt since lead is used within the HNPF cask's gamma-shielding region. Parameters, such as surface emissivity and internal heat generation rate, can affect the results of the thermal analysis which control the amount of lead melt. A parameter sensitivity analysis was performed using a one-dimensional model to describe how surface emissivity and internal heat generation rates affect the temperature distribution within the cask. The information from this analysis was used to determine the range of parameters for the two-dimensional thermal analysis. 13 refs., 57 figs., 8 tabs.

49359 **(SAND—87-1372C) Burnup credit in the design of spent fuel shipping casks.** Sanders, T.L.; Westfall, R.M.; Wilmot, E.L. (Sandia National Labs., Albuquerque, NM (USA); Oak Ridge National Lab., TN (USA); USDOE Office of Civilian Radioactive Waste Management, Washington, DC). May 1987. Contract AC04-76DP00789. 7p. (CONF-871101—1; TTC—0740). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87010518.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The spent fuel carrying capacities of previous generation shipping casks have been primarily thermal and/or shielding limited. Shielding and heat transfer requirements for casks designed to transport older spent fuel with longer decay times are reduced significantly. Thus, a considerable weight margin is available to the designer for increasing the payload capacity. One method of achieving an increase in capacity is by reducing fuel assembly spacing. The amount of reduction in assembly spacing available is limited by criticality and fuel support structural concerns. The optimum fuel assembly spacing achievable is then limited by requirements to both control neutron multiplication and ensure the structural integrity of fuel support components. An investigation of the feasibility of accounting for fuel burnup in the design of spent fuel shipping casks was recently completed for the US Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM). The purpose of this presentation is to describe the results of the criticality analyses and briefly summarize potential impacts in terms of increased cask capacities with associated costs and safety benefits. The scope of the analysis is limited to typical burnups of full-cycle, discharged pressurized water reactor (PWR) fuel and generic shipping cask designs. The burnup and criticality analyses were performed with various SCALE system modules: ORIGEN-S, NITAWL-S, XSDRNPM, KENO V.a, and the SCALE 22 group ENDF/B-IV cross section library enchanced with ENDF/B-V fission produced data. 3 refs., 1 fig.

49360 **(SAND—87-1707C) A design approach for qualifying the use of ductile cast iron spent fuel shipping casks in the USA.** Sorenson, K.B. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 11p. (CONF-8706210—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012874.

From BAM seminar on containers for radioactive materials made from ductile cast iron; West Berlin, F.R. Germany (9 Jun 1987).

Recent ductile cast iron (DCI) research work, as applied to transport casks, in the United States has focused on developing a design methodology which could be used as acceptance criteria for DCI casks. Sandia National Laboratories has concentrated on advancing the linear elastic fracture mechanics design approach to cask design. The approach allows for the design of transport casks fabricated out of ferritic materials (such as DCI) which undergo a brittle/ductile failure mode transition. The Sandia program encompasses material characterization, finite element structural analysis, nondestructive examination evaluation and drop test verification. Recent results of the program and near-term efforts are described. 6 refs., 5 figs.

49361 **(SAND—87-1708C) Material specification for ductile cast iron in the United States.** Sorenson, K.B. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 9p. (CONF-8706210—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013061.

From BAM seminar on containers for radioactive materials made from ductile cast iron; West Berlin, F.R. Germany (9 Jun 1987).

The United States currently does not have formal design criteria for qualifying ductile cast iron (DCI) transportation casks. There is also no dedicated material standard for DCI for this particular application. Recognizing the importance of a material standard for this application, Lawrence Livermore Laboratories, in a report to the NRC, recommended that steps be taken to develop an ASTM material specification suitable for spent fuel shipping containers. A draft ASTM material specification has been written and is currently in the ASTM approval process. This paper reviews the brief history of the development of the specification, the technical basis for the material properties, the ASTM approval process and the current status of the draft specification. The expected implications of having an adopted ASTM specification on the licensing process are also discussed. The relationship of fracture toughness to composition, microstructure and tensile properties has been evaluated at Sandia National Laboratories. The first main conclusion reached is that static fracture toughness is essentially decoupled from tensile properties such as yield strength, tensile strength and ductility. The significance of this finding is that tensile properties provided for in existing DCI specifications should not be used as an indicator of a material's ability to resist crack initiation. A material specification which includes fracture toughness requirements is needed to address the brittle fracture concerns. Second, static fracture toughness was found to correlate well with material microstructure; specifically, graphite nodule count or nodule spacing.

49362 **(SAND—87-1920C) Measurements in large JP-4 pool fires.** Keltner, N.R.; Kent, L.A.; Schneider, M.E. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 4p. (CONF-871131—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013445.

From Combined meetings of the Eastern Section of the Combustion Institute 20th fall technical meeting on chemical and physical processes in combustion and National Bureau of Standards annual conference; Gaithersburg, MD, USA (2 Nov 1987).

Over the past four years, Sandia National Laboratories has conducted a number of large pool fire tests to evaluate the design of radioactive material (RAM) shipping containers. Some of these tests have been designed to define the thermal environment and some have been used for certification testing. In each test there have been a number of fire diagnostic measurements. The simplest sets of diagnostics have involved measurements of temperature at several elevations on arrays of towers, measurements of hot wall heat flux with small calorimeters suspended from the towers, the average fuel recession rate, and the wind speed and direction. The most complex sets of diagnostics have included the above and in various tests added radiometers in the lower flame zone, centerline velocity measurements at a number of elevations, radiometers and calorimeters at the fuel surface, large cylindrical and flat plate calorimeters, infrared imaging, time resolved fuel recession rates, and a variety of soot particle concentration and size measurements made in the plume with a tethered balloon and an instrumented airplane. All of the large fires have been conducted in a 9.1 m by 18.3 m pool using JP-4 as the fuel. Typical duration is one-half hour. Covering all of the results is beyond the scope of a single paper. Conditionally sampled temperature and velocity measurements from one fire will be presented; for this fire, a 20 cm layer of fuel was floated on 61 cm of water. Pool surface heat flux, fuel recession rate data, and smoke emission data from a second fire are given. Because the wind has a strong effect on the temperature and velocity measurements, conditional sampling has been used to try to obtain data during periods of low winds. 10 refs., 3 figs.

0510 Marketing, Economics, And By-products

49363 (IWGFR—60, pp 150-151) **Report by NEA/OECD on uranium supply and demand.** Thexton, H.E. (Nuclear Energy Agency, 75 - Paris, France). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

The NEA and IAEA will be publishing the latest version of their report Uranium: Resources Production and Demand (the "Red Book") in 1986. A summary of the supply/demand position is given in this paper. The studies show that uranium supplies are unlikely to limit thermal reactor development for at least several decades. However, security of supply and independence of supply will likely provide sufficient justification for several countries to deploy fast reactors during this period provided the cost of generation is similar for the two reactor types. 2 tabs.

0520 Waste Management

REFER ALSO TO CITATION(S) 49336, 49338, 49344, 49345, 49355, 49461, 49463, 49464, 49583, 49583, 49672, 50060, 50336

49364 (ANL/EES-TM—312) Quality Assurance Program: Argonne peer review activities for the salt host-rock portion of the Civilian Radioactive Waste Management Program. Edgar, D.E. (Argonne National Lab., IL (USA)). 12 Aug 1986. Contract W-31109-ENG-38. 139p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE87013112.

This Quality Assurance (QA) Program sets forth the methods, controls, and procedures used to ensure that the results of Argonne National Laboratory's peer review activities are consistently of the highest quality and responsive to Salt Repository Project Office's needs and directives. Implementation of the QA procedures described herein establishes an operational framework so that task activities are traceable and the activities and decisions that influence the overall quality of the peer review process and results are fully documented. 56 refs., 5 figs., 6 tabs.

49365 (ANL/EES-TM—336) Solid and aqueous species of significance for the siting of a high-level nuclear waste repository in rock salt: An evaluation of data needs for lead, tin, strontium, and selenium. Brubaker, K.L. (Argonne National Lab., IL (USA). Energy and Environmental Systems Div.). Jun 1987. Contract W-31109-ENG-38. 98p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87012854.

The literature on the solubility of solids and the formation of aqueous complexes containing lead, tin, strontium, and selenium was surveyed for the purposes of identifying substances that are likely to limit the concentrations of these elements in brines associated with rock salt deposits. Lists were screened using solubility computations for those substances for which thermodynamic data were available. Qualitative criteria were used for those for which data were lacking. The potentially most limiting substances found were galena (PbS) and pyromorphite ($Pb_5(PO_4)_3Cl$) for lead, cassiterite (SnO_2) for tin, celestite ($SrSO_4$) for strontium, and the calcium and magnesium selenites ($CaSeO_3$ and $MgSeO_3$) for selenium. The well-known chloride complexes are the dominant aqueous species expected for lead in brines. Insufficient experimental data exist for the other three elements to assess with any confidence their likely speciation in brines, although chloride complexes would probably be important for tin and srontium. 99 refs., 6 figs., 34 tabs.

49366 (BMI/ONWI—622) Quaternary studies in the Paradox Basin, southeastern Utah. Biggar, N. (Woodward-Clyde Consultants, San Francisco, CA (USA); Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Aug 1987. Contract AC02-83CH10140. 273p. NTIS, PC E14/MF $5.95; 1; GPO Dep. File Number DE87014716.

Studies have included paleoclimatic assessments and evaluation of the Needles Fault zone, and an assessment of geologic age dating results and techniques. Fossil pollen, snail shells, pack rat middens, and Holocene stratigraphic units have been examined as potential paleoclimatic indicators. Of these, the most definitive data have been an interpreted 13,000-year vegetation record found in the pack rat middens. This record defines the late Pleistocene-Holocene climatic transition at approximately 10,000 years ago, and indicates that temperature decreased and precipitation increased during the late Pleistocene relative to the present. In the Needles Fault zone, age dating results and geomorphic studies indicate that the northeastern grabens may be the youngest and that the system is at least 65,000 years old. Using this date and an assumed Colorado River incision rate, the maximum rate at which grabens have spread eastward from the river canyon can be estimated. The most useful age dating techniques for the Paradox Basin are the accumulation of pedogenic carbonate in the soil profile, radiocarbon dating, thermoluminescence dating, amino acid diagenesis of mollusk shells, paleomagnetic analysis of early Pleistocene deposits, and topographic position of deposits and surfaces. Method applicability depends on the datable materials present, the estimated age of the sample or deposit, and potential contaminants that could affect analysis. 108 refs., 64 figs., 35 tabs.

49367 (BMI/ONWI—649) Numerical modeling of deformation in salt basins: Technical report. Chang, C.Y.; O'Rourke, J.E.; Tsai, F.C.; Silva, W.J. (Woodward-Clyde Consultants, San Francisco, CA (USA)). Jul 1987. Contract AC02-83CH10140. 209p. NTIS, PC E03/MF A01. File Number DE87013596.

The report describes the dominant physical mechanisms and the material properties influence in the formation of natural salt deformation features within a salt basin. Numerical analysis techniques include one-dimensional, closed-form analytical solutions; one-dimensional analytical solutions employing a numerical propagator matrix technique; and a two-dimensional, finite-element, viscoplastic numerical code (MANTLE). The published works of earlier investigators were reviewed, along with conventional applications of the one-dimensional, closed-form solutions. Earlier work was extended to more complex multilayered, thin interbed systems, using a numerical propagator matrix. Nonlinear salt properties and two-dimensional mechanisms were modeled, including horizontal tectonic strain, predeposition-of-salt basement faulting, and postdeposition-of-salt basement faulting, with vertical shear stress produced in the overlying salt. The study concludes that the conventional analyses using assumed effective viscosities for salt and density-inversion mechanics are incorrect, first-order or major perturbations in a bedded salt formation require the application of shear stress to initiate the appropriate growth rate, a condition of postdeposition basement faulting is the probable mechanism to initiate such shear stress, and interbed and internal salt fabric (second-order and higher) deformation characteristics can be strongly asymmetric to the major deformation surfaces in the region of basement faulting/shear stress location. 28 refs., 70 figs., 3 tabs.

49368 (BMI/ONWI—651) Brine migration test for Asse Mine, Federal Republic of Germany: Final design report. (Westinghouse Electric Corp., Pittsburgh, PA (USA); Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Aug 1987. Contract AC02-83CH10140. 315p. NTIS, PC A14/MF A01; 1; GPO Dep. File Number DE87014332.

One issue related to the disposal of high-level nuclear waste in natural rock salt formations is the amount of brine released from the salt upon heating by the waste. A test has been installed in the Asse mine in the Federal Republic of Germany that includes heating and radiation on a large scale to simulate a potential repository environment and includes instrumentation to observe water production and related parameters. Four test sites will be operated for two years, producing a maximum salt temperature of 210°C over a 2-m (78-in.) long by 43-cm (17-in.) internal diameter test volume in the salt. The design and installation of this test and the rationale for this design are included in this report. 29 refs., 106 figs., 17 tabs.

49369 (BMI/ONWI—652) Expected near-field thermal performance for nuclear waste repositories at potential salt sites: Technical report. McNulty, E.G. (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Aug 1987. Contract AC02-83CH10140. 134p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE87013866.

Thermal analyses were made for the environmental assessments of seven potential salt sites for a nuclear waste repository. These analyses predicted that potential repository sites in domal salts located in the Gulf Coast will experience higher temperature than those in bedded salts of Paradox and Palo Duro Basins, mainly because of higher ambient temperatures at depth. The TEMPV5 code, a semi-analytical heat transfer code for finite line sources, calculated temperatures for commercial high-level waste (CHLW) and spent fuel from pressurized-water reactors (SFPWR). Benchmarks with HEATING6, THAC-SIP-3D, STEALTH, and SPECTROM-41 showed that TEMPV5 agreed closely in the very near field around the waste package and approximately in the near-field and far-field regions of the repository. The analyses used site-specific thermal conductivities that were increased by 40% to compensate for reductions caused by testing technique, salt impurities, and other heterogeneities, and sampling disturbance. Analyses showed peak salt temperatures of 236°C (CHLW) and 134°C (SFPWR) for the bedded salt and 296°C (CHLW) and 180°C (SFPWR) for the domal salt. Analyses with uncorrected laboratory thermal conduc-

tivities would increase peak salt temperatures by about 120°C for CHLW and about 60°C for SFPWR. These temperature increases would increase the thermally induced flow of brine and accelerate corrosion of the waste package. 30 refs., 35 figs., 48 tabs.

49370 **(BMI/ONWI—653) Verification of the 2.00 WAPPA-B [Waste Package Performance Assessment-B version] code.** Tylock, B.; Jansen, G.; Raines, G.E. (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Jul 1987. Contract AC02-83CH10140. 71p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87014333.

The old version of the Waste Package Performance Assessment (WAPPA) code has been modified into a new code version, 2.00 WAPPA-B. The input files and the results for two benchmarks at repository conditions are fully documented in the appendixes of the EA reference report. The 2.00 WAPPA-B version of the code is suitable for computation of barrier failure due to uniform corrosion; however, an improved sub-version, 2.01 WAPPA-B, is recommended for general use due to minor errors found in 2.00 WAPPA-B during its verification procedures. The input files and input echoes have been modified to include behavior of both radionuclides and elements, but the 2.00 WAPPA-B version of the WAPPA code is not recommended for computation of radionuclide releases. The 2.00 WAPPA-B version computes only mass balances and the initial presence of radionuclides that can be released. Future code development in the 3.00 WAPPA-C version will include radionuclide release computations. 19 refs., 10 figs., 1 tab.

49371 **(BMI/ONWI—654) Expected brine movement at potential nuclear waste repository salt sites.** McCauley, V.S.; Raines, G.E. (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Aug 1987. Contract AC02-83CH10140. 152p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87014334.

The BRINEMIG brine migration code predicts rates and quantities of brine migration to a waste package emplaced in a high-level nuclear waste repository in salt. The BRINEMIG code is an explicit time-marching finite-difference code that solves a mass balance equation and uses the Jenks equation to predict velocities of brine migration. Predictions were made for the seven potentially acceptable salt sites under consideration as locations for the first US high-level nuclear waste repository. Predicted total quantities of accumulated brine were on the order of 1 m^3 brine per waste package or less. Less brine accumulation is expected at domal salt sites because of the lower initial moisture contents relative to bedded salt sites. Less total accumulation of brine is predicted for spent fuel than for commercial high-level waste because of the lower temperatures generated by spent fuel. 11 refs., 36 figs., 29 tabs.

49372 **(BMI/ONWI—659) Hypocenters (1977-1984) around the Richton Dome and the Melvin, Alabama, 1978 earthquake.** (Earth Technology Corp., Long Beach, CA (USA); Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Aug 1987. Contract AC02-83CH10140. 43p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014336.

Seventeen detected earthquakes (1977 to 1984) in the eastern Mississippi and Alabama region are relocated to determine how accurately these earthquakes can be located and what depth constraints are available. Arrival time data from the Southeastrn US Seismic Network (SEUSSN) bulletins and five different velocity models are used to recalculate the hypocenter locations. Differences in locations depending on the velocity model used are small both inside the seismograph network in Alabama and at the edge of the network in eastern Mississippi. The calculated standard horizontal location errors range from 1 to 19 km, although most of the locations have errors from 2 to 10 km. In most cases, the depth is unconstrained. Since only 17 earthquakes occurred during a 7-year period in a large geographical area, no simple conclusions can be drawn about the rate of seismic activity or correspondence between earthquakes and geologic structures. The December 11, 1978, Melvin, Alabama, earthquake (m/sub bLg/ = 3.5) is relocated and its possible mechanism is discussed because of its proximity to the Richton Dome. The epicenter is located near the Pickins-Gilbertown fault zone and near the Mississippi-Alabama state line. The mechanism of the Melvin earthquake cannot be determined, but the event is interpreted to be a natural tectonic event rather than an artificially induced event. 45 refs., 3 figs., 7 tabs.)

49373 **(BNL-NUREG—40094) Verification and update of BNL mixed waste survey.** Bowerman, B.S.; Siskind, B. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 6p. (CONF-870859—12). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014290.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

This report briefly describes attempts to verify the results of a previous survey on the amount of mixed wastes generated at various facilities during 1985. The original survey indicated some lack of understanding of current EPA regulations. This telephone survey verification indicated a better understanding of these regulations in recent months. Changes in EPA regulations and the addition of new compounds to the list of hazardous wastes are causing problems for organizations trying to comply. 7 refs. (TEM)

49374 **(CONF-870859—13-Vugraphs) Information requirements for the Department of Energy Defense Programs' hazardous and mixed wastes.** Herron, S.A. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014568.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

This document contains viewgraphs from a presentation made to the DOE Low-Level Waste Management Conference in Denver, Colorado. The presentation described information and data base systems that describe hazardous and mixed waste treatment, storage, and disposal. (TEM)

49375 **(CONF-870948—2) MRS [monitored retrievable storage] to transportation system interfaces.** Row, T.H.; Croff, A.G. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014949.

From American Nuclear Society topical meeting on the integrated spent fuel and HLW management system; Albuquerque, NM, USA (27 Sep 1987).

In March 1987, the US Department of Energy presented to Congress the proposal to construct and operate a facility for the monitored retrievable storage (MRS) of spent fuel at a site on the Clinch River in the Roane County portions of Oak Ridge. In discussing the MRS to Transportation System Interfaces, the authors provide a blending of the technical and institutional issues, for they do not believe the solutions to success of this enterprise lie wholly in one area. The authors cover: early chronology of the MRS; comparison of total-system life cycle cost estimates of the authorized system and improved-performance system (i.e., the system that includes a facility for MRS); transportation costs resulting from shipping, security and cask; assumptions for dedicated rail transport from MRS to repository; and significant results from the Total System Life Cycle Cost (TSLCC) analysis of the improved performance system. (AT)

49376 **(CONF-871018—Vol.1) Proceedings of the 1987 international decommissioning symposium.** Tarcza, G.A. (ed.). (Westinghouse Hanford Co., Richland, WA (USA)). 1987. Contract AC06-87RL10930. 559p. NTIS, PC A24. File Number DE87012821.

From International decommissioning symposium; Pittsburgh, PA, USA (4 Oct 1987).

Individual papers are processed separately for the data bases. (PSB)

49377 **(CONF-871018—Vol.2) Proceedings of the 1987 international decommissioning symposium.** Tarcza, G.A. (ed.). (Westinghouse Hanford Co., Richland, WA (USA)). 1987. Contract AC06-87RL10930. 717p. NTIS, PC A99/MF A01; 1; GPO Dep. File Number DE87012822.

From International decommissioning symposium; Pittsburgh, PA, USA (4 Oct 1987).

Individual papers are processed separately for the data bases. (PSB)

49378 **(CONF-871101—31) Studies involving proposed waste disposal facilities in Turkey.** Uslu, I.; Fields, D.E.; Yalcintas, M.G. (Oak Ridge National Lab., TN (USA); Atomenerjisi Komisyonu, Ankara (Turkey)). 1987. Contract AC05-84OR21400. 3p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011583.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

Today principal sources of radioactive wastes are hospitals, research institutions, biological research centers, universities, industries and two research reactors in Turkey. These wastes will be treated in a pilot waste treatment facility located in Cekmece Nuclear Research and Training Center, Istanbul. In this temporary waste disposal facility, the wastes will be stored in 200 liter concrete containers until the establishment of the permanent waste disposal sites in Turkey, in 1990. The PRESTO - II (Prediction of Radiation Effects From Shallow Trench Operations) computer code was applied for the general probable sites for LLW disposal in Turkey. The model is non-site specific screening model for assessing radionuclide transport, ensuring exposure, and health impacts to a static local population for a chosen time period, following the end of the disposal operation. The methodology that this codes takes into consideration is versatile and explicitly considers infiltration and percolation of surface water into the trench, leaching of radionuclides, vertical and horizontal transport of radionuclides and use of this contaminated ground water for farming, irrigation, and ingestion.

49379 **(DOE/HWP—39) Nitrate destruction in an elutriated fluid-bed calciner.** Cowan, R.G.; Cash, R.J.; Owen, T.J.; Shook, G.E. (Westinghouse Hanford Co., Richland, WA (USA)). Sep 1987. Contract AC06-87RL10930. 37p. (WHC-EP—0062). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000670.

Nitrate destruction was demonstrated using an elutriated fluid-bed calciner process developed for nuclear fuel mixed-oxide conversion. Testing was directed to treatment of sodium nitrate, a major waste component at the Hanford Site. One test was also performed with copper nitrate. All tests produced low concentrations of NO/sub x/ in the offgas. The chemistry developed for uranium and plutonium nitrate appears to apply to other metal nitrates. The copper nitrate test was successful, with over 90% of the nitrate converted to elemental nitrogen and water and with recovery of a granular, free-flowing copper product. Tests with sodium nitrate were not successful due to fusion of sodium carbonate in the calciner bed and plugging of the calciner. Further development of the elutriated fluid-bed system would be required to process high sodium nitrate waste solutions.

49380 **(DOE/ID/12313—T1) Low-level radioactive waste management program at the University of Maryland at Baltimore.** Cooley, L.R. (Maryland Univ., Baltimore (USA)). 21 Mar 1985. Contract FG07-81ID12313. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014528.

This report describes the overall waste management program at the University of Maryland at Baltimore (UMAB) and then specifically addresses the incineration of low-level radioactive waste (LLRW), the equipment and procedures involved, and the results achieved. Specific recommendations or suggestions are offered for those considering the use of incineration in their programs. 5 figs., 7 tabs.

49381 **(DOE/ID/12313—T2) Incineration in low-level radioactive waste management at the University of Maryland at Baltimore.** Cooley, L.R. (Maryland Univ., Baltimore (USA). Radiation Safety Office). [1986]. Contract FG07-81ID12313. 3p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014529.

The selection of an incinerator by the University of Maryland at Baltimore was carried out under a demonstration grant from the Department of Energy (DOE). The system selected is a 300 lb per hour dual-chambered, controlled air incinerator. The cost of the unit was $130,000, excluding installation. The interior is lined with high temperature brick rather than a castable refractory. The burners in the upper and lower chambers are "oversized" to insure responsive temperature control of 2.5 million Btu/h in the upper chamber and 1.3 million Btu/h in the lower. The prescribed operating temperatures are 1900 to 2100°F in the upper chamber and 900 to 1200°F in the lower chamber. The system has a rated capacity of 300 lbs/h of type IV, pathological waste, but operational experience has limited our feed rate to 150 lbs/h.

49382 **(DOE/ID/12511—T5) Hydraulic containment of low-level radioactive waste disposal sites: [Final technical report].** Ostendorf, D.W.; Noss, R.R.; Miller, A.B.; Phillips, H.S. (Massachusetts Univ., Amherst (USA). Dept. of Civil Engineering). 1987. Contract FG07-84ID12511. 155p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87014511.

This document describes the use of impermeable barriers for the containment of liquid radioactive wastes at low-level radioactive waste disposal sites. Included are a review of existing barrier systems, assessments of laboratory and field data, and simulations of system performance under humid and arid conditions. Alternatives are identified as the most promising of the existing systems based on retention of irradiated water, field installation feasibility, and response to aggressive permeation. In decreasing order of preference, the favored systems are asphalt slurry, high density polyethylene synthetic liner, polyvinyl chloride synthetic liner, lean portland cement concrete, and compacted bentonite liner. It should be stressed that all five of these alternatives effectively retain irradiated water in the humid and arid simulations. Recommendations on the design and operation of the hydraulic containment system and suggestions on avenues for future research are included. 102 refs., 27 figs., 23 tabs.

49383 **(DOE/ID/12564—T1) The low-level waste handbook: A user's guide to the Low-Level Radioactive Waste Policy Amendments Act of 1985.** Brown, H. (National Governors' Association, Washington, DC (USA)). Nov 1986. Contract FG07-85ID12564. 152p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87014504.

This report provides a detailed, section-by-section analysis of the Low-Level Radioactive Waste Policy Amendments Act of 1985. Appendices include lists of relevant law and legislation, relevant Congressional committees, members of Congress mentioned in the report, and exact copies of the 1980 and 1985 Acts. (TEM)

49384 **(DOE/ID/12564—T2) A nationwide low-level waste management system.** (National Governors' Association, Washington, DC (USA)). 9 Aug 1985. Contract FG07-85ID12564. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014505.

The National Governors' Association, in conjunction with the Department of Energy's National Low-Level Waste Management Program, invited various representatives of states, regions, and federal agencies to comment on their perceptions of what major features would constitute a nationwide low-level waste management system. Three meetings were conducted and this report summarizes results of those meetings. The Low-Level Radioactive Waste Policy Act of 1980 placed primary responsibility on the states for disposal of low-level waste. Although initial efforts of states have been directed toward establishing compacts, it is evident that a successful long term system requires significant cooperation and communication among states, regions, federal agencies, and Congress.

49385 **(DOE/NBM—7013294) Moderate temperature zeolitic alternation in a cooling pyroclastic deposit.** Levy, S.S.; O'Neil, J.R. (Los Alamos National Lab., NM (USA); Geological Survey, Menlo Park, CA (USA)). 1984. Contract W-7405-ENG-36. 18p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87013294.

The locally zeolitized Topopah Spring Member of the Paintbrush Tuff, Yucca Mountain, Nevada, USA is part of a thick sequence of zeolitized pyroclastic units. Most of the zeolitized units

are nonwelded tuffs that were altered during low temperature diagenesis, but the distribution and textural setting of zeolite (heulandite-clinoptilolite and smectite in the densely welded Topopah Spring tuff suggests that these hydrous minerals formed while the tuff was still cooling after pyroclastic emplacement and welding. The hydrous minerals are concentrated within a transition zone between devitrified tuff in the central part of the unit and underlying vitrophyre. Movement of liquid and convected heat along fractures from the devitrified tuff to the vitrophyre caused local devitrification and hydrous mineral crystallization. Oxygen isotope geothermometry of cogenetic quartz confirms the nondiagnetic moderate temperature origin of the hydrous minerals at temperatures of about 40 to 100°C, assuming a meteoric water source. 14 refs., 3 figs., 1 tab.

49386 **(DP-MS—86-186) Savannah River Plant low-level waste incinerator: Operational results and technical development.** Irujo, M.J.; Bucci, J.R. (Savannah River Lab., Aiken, SC (USA)). Apr 1987. Contract AC09-76SR00001. 16p. (CONF-870429—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014833.

From 6. annual conference on incineration of mixed and low-level radioactive wastes; St. Charles, IL, USA (22 Apr 1987).

Volume reduction of solid and liquid low-level waste has been demonstrated at the Savannah River Plant (SRP) in the Waste Management Beta-Gamma Incinerator facility (BGI). The BGI uses a two-stage, controlled-air incinerator capable of processing 180 kg/hr (400 lbs/hr) of solid waste or 150 liters/hr (40 gal/hr) of liquid waste. These wastes are pyrolyzed in a substoichiometric air environment at 900 to 1100 degrees Celsius in the primary chamber. Products of partial combustion from the primary chamber are oxidized at 950 to 1150 degrees Celsius in the secondary chamber. A spray dryer, baghouse,and HEPA filter unit cool and filter the incinerator offgases. 2 refs., 9 tabs.

49387 **(DP-MS—87-23) Analysis of radioactive waste and glass for a defense waste solidification plant.** Coleman, C.J.; Baumann, E.W.; Bibler, N.E.; Dewberry, R.A.; Sturcken, E.F. (Savannah River Lab., Aiken, SC (USA)). 1987. Contract AC09-76SR00001. 14p. (CONF-870802—15). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014200.

From 194. American Chemical Society national meeting; New Orleans, LA, USA (30 Aug 1987).

Analytical methods have been developed and evaluated for supporting a high-level radioactive waste solidification plant. Radioactive defense waste from the Savannah River Plant will be combined with glass-making chemicals and melted at 1150°C to form borosilicate glass. This glass will be placed in safe permanent disposal. Remote methods for dissolving and analyzing melter feed and glass containing actual radioactive waste were demonstrated in shielded cells. Microwave technology was used to dissolve samples and measure moisture content. A colorimetric method for measuring the Fe(II)/Fe(III) ratio in the glass was developed and demonstrated using a fiber optic-coupled spectrophotometer. Other methods for characterizing feed and glass samples include elemental analysis by ion chromatography, inductively coupled plasma-atomic emission spectroscopy, and atomic absorption spectrometry. Major radionuclides, ^{137}Cs, ^{90}Sr, and ^{238}Pu could be measured directly by counting techniques. Minor radionuclides such as ^{99}Tc required separation procedures prior to counting.

49388 **(DP-MS—87-34) Economics of defense high level waste management in the United States.** McDonell, W.R. (Savannah River Lab., Aiken, SC (USA)). 1987. Contract AC09-76SR00001. 17p. (CONF-871102—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87010201.

From International waste management conference; Kowloon, China (30 Nov 1987).

Life-cycle costs of defense waste disposal, as presented in the foregoing sections, are summarized. Expressed as incremental costs per canister of waste deposited in a Federal geologic repository and per gallon of decontaminated salt solution immobilized in onsite concrete vaults, the tabulated values provide a measure of waste management costs relatively independent of the inventories of waste processed. Total values are about $350,000 per glass waste canister processed and $4.68 per gallon of decontaminated salt immobilized. These costs do not generally include contributions of fixed charges, such as capital costs, except in the case of transport and repository charges for which the quantities of waste handled determine allocation of fixed costs included in the fee assessments. 14 refs., 2 figs., 3 tabs.

49389 **(DP-MS—87-47) Alternative disposal technologies for new low-level radioactive waste disposal/storage facilities at the Savannah River Plant.** Cook, J.R. (Savannah River Lab., Aiken, SC (USA)). 1987. Contract AC09-76SR00001. 11p. (CONF-870859—11). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014436.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

A Draft Environmental Impact Statement for Waste Management Activities for groundwater protection has been prepared for the Savannah River Plant. Support documentation for the DEIS included an Environmental Information Document on new radioactive waste disposal and storage facilities in which possible alternative disposal technologies were examined in depth. Six technologies that would meet the needs of the Savannah River Plant that selected for description and analysis include near surface disposal, near surface disposal with exceptions, engineered storage, engineered disposal, vault disposal of untreated waste, and a combination of near surface disposal, engineered disposal, and engineered storage. 2 refs.

49390 **(DP-MS—87-60) Program for closure of an inactive radioactive waste disposal site at the Savannah River Plant.** Cook, J.R. (Savannah River Lab., Aiken, SC (USA)). 1987. Contract AC09-76SR00001. 15p. (CONF-870859—16). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014831.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

The 643-G Radioactive Waste Disposal Facility was operated at the Savannah River Plant from 1952 through 1974, and has been inactive since that time. The actions leading to closure of 643-G will involve a combination of activities consisting of limited waste removal, stabilization, capping, and monitoring. The overall effect of these closure actions will be to place the 643-G site in a physically and chemically stable state which will remain stable over a long period of time. During a one-hundred year institutional control period surveillance and monitoring of the site will be carried out to verify that the performance of the system is acceptable, and access of the general public to the site will be restricted. The program described in this paper is a recommendation; the actual closure plan will be negotiated with regulatory authorities. 2 figs., 1 tab.

49391 **(DP-MS—87-78) Environmental analysis of closure options for waste sites at the Savannah River Plant.** Gordon, D.E.; King, C.M.; Looney, B.B.; Stephenson, D.E.; Johnson, W.F. (Savannah River Lab., Aiken, SC (USA)). 1987. Contract AC09-76SR00001. 21p. (CONF-870859—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014439.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

Previously acceptable waste management practices (e.g., the use of unlined seepage basins) for discarding of wastes from nuclear materials production has resulted in occasional cases of groundwater contamination beneath some disposal sites, mainly in water-table aquifers. Groundwater contaminants include volatile organic compounds, heavy metals, radionuclides, and other chemicals. The closure of active and inactive waste sites that have received hazardous and/or low-level radioactive materials at the Savannah River Plant (SRP) is planned as part of an overall program to protect groundwater quality. DOE developed and submitted to Congress a groundwater protection plan for SRP. This initial plan and subsequent revisions provide the basis for closure of SRP waste sites to comply with applicable groundwater protection requirements. An environmental analysis of the closure options for the criteria waste sites that have received hazardous and/or low-level radioactive wastes was conducted to provide technical support. The several parts of this environmental analysis include description of geohydrologic conditions; determination of waste inventories; definition

of closure options; modeling of environmental pathways; assessment of risk; and analysis of project costs. Each of these components of the overall analysis is described in turn in the following paragraphs. Production operations at SRP have generated a variety of solid, hazardous, and low-level radioactive waste materials. Several locations onplant have been used as waste disposal sites for solid and liquid wastes. Seventy-six individual waste sites at 45 distinct geographical locations on SRP have received hazardous, low-level radioactive, or mixed wastes. These waste sites can be categorized into 26 groupings according to the function of the waste disposed. 15 refs., 6 figs., 5 tabs.

49392 **(DP-MS—87-79) Pathway analysis models used for assessment of forty-five waste site areas at the Savannah River Plant.** Looney, B.B.; Stephenson, D.E.; King, C.M.; Fjeld, R.A.; Sill, B.L.; Merrell, G.B.; Rogers, V.C. (Savannah River Lab., Aiken, SC (USA); Clemson Univ., SC (USA). Dept. of Environmental Systems Engineering; Rogers and Associates Engineering Corp., Salt Lake City, UT (USA)). 1987. Contract AC09-76SR00001. 17p. (CONF-870859—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014195.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

The technical staff at Savannah River Plant (SRP) has identified forty-five locations that received (or may have received) a variety of radioactive and nonradioactive constituents during the past 35 years. These locations include surface impoundments and shallow land burial facilities. Detailed environmental assessments of existing waste disposal areas have been completed to aid in an evaluation of the hazardous, low-level radioactive, and mixed waste management activities at SRP. These assessments result in estimation of risk, or residual risk, posed by each disposal area to various receptors as a function of waste management alternative. The closure actions evaluated for existing waste sites were waste removal and closure, no waste removal and closure, and no action; several pathways/receptors were considered, including groundwater to river, groundwater to well, atmospheric transport, occupational exposure, direct exposure, and contamination followed by ingestion of crops and meat. 32 refs., 4 figs., 1 tab.

49393 **(DP-MS—87-81) Three-dimensional simulation of groundwater flow and transport of chemical and low-level radioactive constituents within two production areas of the Savannah River Plant.** Stephenson, D.E.; Looney, B.B.; Andrews, C.B.; Buss, D.R. (Savannah River Lab., Aiken, SC (USA); Papadopulos (S.S.) and Associates, Inc., Rockville, MD (USA); GeoTrans, Inc., Herndon, VA (USA)). 1987. Contract AC09-76SR00001. 10p. (CONF-870859—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014196.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

Modeling of transport in the environmental media was performed. Predicting the future performance of any waste site or facility and postulated actions in terms of migration of potential hazardous materials requires mathematical models capable of simulating flow and transport in the groundwater. Three-dimensional groundwater flow and transport models were developed to simulate the groundwater movement and contaminant transport in the Raw Materials Fabrication Area and the Separations Area. The overall objective of the analysis was to develop groundwater flow models that quantifies the rate and direction of the groundwater movement from the waste sites to points of discharge. The USGS Modular 3D model uses the strongly implicit procedure to solve sets of simultaneous finite-difference equations that represent the groundwater flow process. The transport functions, which are the concentration or mass flux at time t due to continuous injection starting at time t', were obtained by solving the three-dimensional advection-dispersion equations using the Sandia Waste Isolation Flow and Transport (SWIFT) model. 5 refs., 7 figs., 2 tabs.

49394 **(DP-MS—87-95) Slag-based saltstone formulations.** Langton, C.A. (Savannah River Lab., Aiken, SC (USA)). Aug 1987. Contract AC09-76SR00001. 8p. (CONF-870859—10). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014435.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

Approximately 400 x 10^6 L of low-level alkaline salt solution will be treated at the Savannah River Plant (SRP) Defense Waste Processing Facility (DWPF) prior to disposal in concrete vaults at SRP. Treatment involves removal of Cs^+ and Sr^{+2}, followed by solidification and stabilization of potential contaminants in saltstone, a hydrated ceramic wasteform. Chromium, technetium, and nitrate releases from saltstone can be significantly reduced by substituting hydraulic blast furnace slag for portland cement in the formulation designs. Slag-based mixes are also compatible with the Class F flyash used in saltstone as a functional extender to control heat of hydration and reduce permeability. (Class F flyash is also locally available at SRP.) A monolithic wasteform is produced by the hydration of the slag and flyash. Soluble ion release (NO^{3-}) is controlled by the saltstone microstructure. Chromium and technetium are less leachable from slag mixes because these species are chemically reduced to a lower valence state by ferrous iron in the slag and are precipitated as relatively insoluble phases, such as $Cr(OH)_3$ and TcO_2. 3 refs., 3 figs., 2 tabs.

49395 **(HEDL-SA—3555-FP) Radiation surveys of radioactive material shipments.** Howell, W.P. (Hanford Engineering Development Lab., Richland, WA (USA)). Jul 1986. Contract AC06-76FF02170. 7p. (CONF-860786—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE87014362.

From Health and safety conference; Albuquerque, NM, USA (15 Jul 1986).

Although contractors function under the guidance of the Department of Energy, there is often substantial variation in the methods and techniques utilized in making radiation measurements. When radioactive materials are shipped from one contractor to another, the measurements recorded on the shipping papers may vary significantly from those measured by the receiver and has been a frequent cause of controversy between contractors. Although significant variances occur in both measurements of radiation fields emanating from shipment containers and measurements of residual radioactivity on the surfaces of the containers, the latter have been the most troublesome. This report describes the measurement of contamination on the exterior surfaces of shipment containers.

49396 (IAEA-TECDOC—419, pp 27-35) **IAEA program for handling, processing and storage of wastes.** Saire, D.E. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Fuel Cycle). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

This paper on the IAEA's program on the handling, treatment, conditioning and storage of radioactive wastes provides a brief overview of current and planned activities by the Agency in this field. The IAEA's program covers three main elements: low-intermediate-level wastes including wastes from nuclear power plants, high-level alpha-bearing wastes and gaseous wastes. 1 fig, 3 tabs.

49397 (IAEA-TECDOC—419, pp 125-133) **Current status of the Swedish waste disposal program.** Ahlstroem, P.E. (Swedish Nuclear Fuel and Waste Management Co., Stockholm). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

Direct disposal without reprocessing is the main strategy for management of spent nuclear fuel in Sweden. Under the present circumstances this is the most economic route. Before final disposal the fuel will be stored for about 40 years in CLAB, a sepcially built underground facility which was put in operation in July 1985. This will give flexibility in the choice of final disposal method. Wastes from reactor operation will be disposed of in SFR, another underground facility in hard rock with planned operation starting in 1988. The total cost for waste management in Sweden is estimated to 47 billion SEK (5.5 billion US$) or about 0.02 SEK/kWh (2.4 mills/kWh) including all types of waste and also the decommissioning of all twelve nuclear power facilities. 4 refs, 3 figs.

49398 (IAEA-TECDOC—419, pp 141-147) **Irradiated fuel management in the United Kingdom.** May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

The United Kingdom has a long-established nuclear generating program starting in 1956. In 1985, 20% of electricity available from the UK public supply came from nuclear power. The current management strategy for the UK irradiated fuel and reprocessing waste is to: 1) continue to reprocess spent Magnox and AGR fuel separating waste products and the recovery of uranium and plutonium; 2) store high-level liquid waste until the Windscale vitrification plant comes on line later in 1980's; 3) store vitrified waste in engineered stores at the surface for at least 50 years before disposal; 4) develop scientific and technical knowledge on alternatives for disposal of HLW; and 5) proceed with establishing disposal routes for the LLW and MLW from reprocessing, nuclear power station operation and other industrial and medical uses. All aspects connected with the national programme on storage, reprocessing, transport and future activities in this subject field are presented. 1 tab.

49399 (IAEA-TECDOC—420, pp 149-156) **Solvent-containing resin for removing uranium from effluent of refining process.** Zhu Changen; Zhou Deyu. (Beijing Research Inst. of Uranium Ore Processing, China). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Two types of solvent-containing resin (CL-5209 and CL-5401) have been prepared by suspension polymerization of monomers in the presence of active components. The active components are dialkyl alkyl phosphonate (for CL-5209) and trialkyl phosphine oxide (for CL-5401) respectively. Uranium in dilute nitric acid or acidic nitrate solution can be adsorbed selectively and efficiently with these resins. Losses of these active components in water are less than 4 ppm. Because of these characters, these resins can be used to remove uranium from effluents of refining process, such as the raffinate from TBP extraction stage, the filtrate from precipitation stage, etc. The concentration of uranium in the raffinate treated with CL-5209 or CL-5401 column is lower than 0.05 mg/L. Ammonium carbonate solution can be used as eluant for loaded column. Water may also be used for elution of loaded CL-5209. Uranium in the eluate may be recovered by precipitation or by recycling the eluate into the feed solution of TBP extraction stage. 11 refs, 4 figs, 1 tab.

49400 (IAEA-TECDOC—420, pp 157-165) **Waste management in the refining and conversion of uranium in Canada.** Ashbrook, A.W. (Eldorado Resources Ltd, Ottawa, Ontario, Canada). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

Eldorado Resources Limited has operated uranium refining facilities at Port Hope, Ontario, since 1942. It was not, however, until 1955 that solvent extraction was used to produce nuclear grade uranium trioxide. In 1958 the production of uranium dioxide was commenced to provide fuel for the domestic CANDU reactors. Conversion facilities were added in 1970 to produce uranium hexafluoride for export. In 1975 a decision was made to build a new refining and conversion facility in the Port Hope area. The outcome was, however, that a new refinery was built at Blind River in northern Ontario (some 500 km north of Port Hope) and a new uranium hexafluoride plant built at the existing Port Hope facility. The Blind River refinery came on-stream in 1983, and the Port Hope conversion plant in 1984. Today, in Canada, uranium yellowcake is refined at Blind River and the uranium trioxide produced is shipped 500 km south to Port Hope where it is converted to uranium dioxide and uranium hexafluoride. Process wastes from the Port Hope facility have been since 1956 and continue to be buried in a licensed waste management site some 16 km from Port Hope. There is no waste management site available to the Blind River refinery, nor is one planned. Because of the increasing need to better manage process wastes, and to reduce their production, Eldorado embarked on a major program to reduce the amount of waste produced, to reduce the amount requiring burial, and to maximise recycle and reuse of these materials. This paper addresses the approach, the successes or otherwise, that Eldorado has had in this endeavor. Since its inception, the program has resulted in achieving more than an 85 percent reduction in the wastes requiring burial, through the recycle of materials to other industries and by instituting process modifications which limit waste production. Initiatives to reduce still further the need for burial are being actively pursued. 6 figs, 3 tabs.

49401 (INIS-mf—10707, pp 1-12) **Interpretation of stress measurements around mining cavities in rock salt - a finite-element study.** Heusermann, S. (Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover, Germany, F.R.). 1986. NTIS (US Sales Only), PC A20/MF A01. File Number DE87752889. (CONF-8609287—Vol.2).

From ECONMIG 86: European conference on numerical methods in geomechanics; Stuttgart, F.R. Germany (16 Sep 1986).

Finite-element studies of stress measurements using the overcoring method and of large drift fields in rock salt show that the measurements are affected by local stress relaxation occurring near the test borehole and by general time-dependent stress redistribution in the marginal zones of adjacent drifts. Analysis of the overcoring method indicates that the following local effects have to be considered in the interpretation of the test results as opposed to measurements in elastic rock: The inelastic deformation behaviour of rock salt causes stress relaxation at the pilot borehole which can lead to an underestimation of the actual stress state in rock. During overcoring considerable inelastic deformations occur in rock salt which demand a modified interpretation of the measurements and as a result of stress relaxation at the borehole various tests conditions, such as overcoring diameter, pilot borehole diameter and time between drilling and overcoring, have an effect on the test results.

49402 (INIS-mf—10707, pp 1-16) **Undrained loading and consolidation analysis for unsaturated soils.** Lloret, A.; Alonso, E.E.; Gens, A. (Universidad Politechnica de Barcelona, Spain. Dept. de Ingenieria del Terreno). 1986. NTIS (US Sales Only), PC A20/MF A01. File Number DE87752889. (CONF-8609287—Vol.2).

From ECONMIG 86: European conference on numerical methods in geomechanics; Stuttgart, F.R. Germany (16 Sep 1986).

In this paper, a computational procedure to calculate deformations of partly saturated soils due to air and water flow is presented. Undrained conditions can also be considered. State surfaces define the behaviour of soil under suction and mean stress changes. In undrained conditions, the analysis is performed by equating the volume changes of free air and water to the variations of volume and degree of saturation caused by changes in stresses and suction. If flow occurs, the analysis is carried out in two stages, uncoupling the transient flow problem from the stress - strain one. Both problems are strongly nonlinear. The formulation is applied to the consolidation of a partly saturated soil after a load application and to the study of infiltration with either free or imposed deformation on the boundary.

49403 (K/SUB—85-22224/4) **Ground-water monitor-well installation at twelve hazardous-waste storage or handling facilities at the Oak Ridge Gaseous Diffusion Plant: Phase 2, Detection monitoring.** Kuhlmeier, P.D.; Motley, C.A. (Geraghty and Miller, Inc., Oak Ridge, TN (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). Jun 1987. Contract AC05-84OT21400. 140p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE87012962.

This report provides construction information for 41 groundwater monitor wells and a narrative describing a drilling, geophysical logging, and hydraulic permeability testing programs to detect and identify chemical compounds that may have entered the uppermost aquifer and any interconnecting aquifers. This investigation is the second phase of well installations at the storage and handling facilities. The initial phase characterized the hydrogeology at each facility. A third phase will delineate the extent of any detected contamination. The sites that were investigated require monitoring. The activities conducted during this investigation included installation of unconsolidated zone wells, installation of bedrock zone

wells, geophysical logging and hydraulic testing of selected wells, and re-development of Phase I monitor wells. 5 refs., 97 figs., 4 tabs.

49404 **(LA-UR—87-1916) Los Alamos Transuranic Waste Size Reduction Facility.** Harper, J.; Warren, J. (Los Alamos National Lab., NM (USA)). Jun 1987. Contract W-7405-ENG-36. 13p. (CONF-871018—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE87011789.

From International decommissioning symposium; Pittsburgh, PA, USA (4 Oct 1987).

The Los Alamos Transuranic (TRU) Waste Size Reduction Facility (SRF) is a production oriented prototype. The facility is operated to remotely cut and repackage TRU contaminated metallic wastes (e.g., glove boxes, ducting and pipes) for eventual disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The resulting flat sections are packaged into a tested Department of Transportation Type 7A metal container. To date, the facility has successfully processed stainless steel glove boxes (with and without lead shielding construction) and retention tanks. We have found that used glove boxes generate more cutting fumes than do unused glove boxes or metal plates - possibly due to deeply embedded chemical residues from years of service. Water used as a secondary fluid with the plasma arc cutting system significantly reduces visible fume generation during the cutting of used glove boxes and lead-lined glove boxes. 2 figs., 1 tab.

49405 **(LA-UR—87-2855) Development of an arid site closure plan.** Nyhan, J.W.; Barnes, F.J. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 22p. (CONF-870859—14). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014755.

From 9. annual low-level radioactive waste management program conference; Denver, CO, USA (25 Aug 1987).

This document describes the development of a prototype plan for the effective closure and stabilization of an arid low-level waste disposal site. This plan will provide demonstrated closure techniques for a trench in a disposal site at Los Alamos. The accuracy of modeling soil water storage by two hydrologic models, CREAMS and HELP, was tested by comparing simulation results with field measurements of soil moisture in eight experimental landfill cover systems having a range of well-defined soil profiles and vegetative covers. Regression analysis showed that CREAMS generally represented soil moisture more accurately than HELP simulations. Precautions for determining parameter values for model input and for interpreting simulation results are discussed. A specific example is presented showing how the field-validated hydrologic models can be used to develop a final prototype closure plan. 15 refs., 13 figs., 3 tabs.

49406 **(LBL—23733) Thermodynamic tables for nuclear waste isolation reference values and neptunium.** Phillips, S.L.; Hale, F.V. (Lawrence Berkeley Lab., CA (USA)). Jul 1987. Contract AC03-76SF00098. 36p. (CONF-870594—2). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000190.

From International conference on thermodynamics of aqueous systems with industrial applications; Warrenton, VA, USA (10 May 1987).

A consistent tabulation of thermodynamic values for neptunium is given. The table consists of values of Gibbs energy of formation, enthalpy of formation, entropy and heat capacity for substances of geochemical interest. The table is consistent with CODATA values and data from other sources; reproduces critically evaluated experimental data; and, is consistent with the relationship $\Delta_r G^\circ = \Delta_r H^\circ - 298.15\ \Delta_r S^\circ$ within defined limits. Important gaps in the data were filled by calculations based on correlations. Selected equilibrium constants and standard potentials were calculated and compared with other work.

49407 **(NAGRA-NTB—83-01) Glasses used in the solidification of high level radioactive waste: their behaviour in aqueous solutions.** Grauer, R. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Feb 1983. 164p. Nagra, CH-5401 Baden, Switzerland.

Because of their amorphous structure, glasses are particularly suitable matrixes for the solidification of the mixture of radionuclides included in the high level wastes from reactor fuel reprocessing. They are not sensitive to variations in the fractions present of different waste oxides and are resistent to the effects of irradiation. In particular, borosilicate glasses have been investigated for around 25 years and the vitrification techniques have been tested on the technological scale. The environmental conditions within a final waste repository are expected to be such that the chemical resistance of glasses to attack by groundwaters is of special interest. In the present report the corrosion behaviour is described, with emphasis being placed upon the most significant controlling parameters. Since experimental determination of corrosion rates must be done in relatively short-time experiments, the results of which can depend strongly upon the measurement methods employed, it is necessary to carry out a critical assessment of the techniques commonly used in laboratory work. Experimental results are illustrated by means of selected examples. Particular emphasis is placed upon the effects of increased temperatures and of irradiation. The models which have been proposed for the estimation of the long-term corrosion behaviour of glasses are not yet fully sufficient and improvements are required. Furthermore, the actual corrosion rates which are fed into such models must be replaced by values more appropriate for the actual environmental conditions to which the glasses are most likely to be exposed within high level waste repositories. It should be noted, however, that even with current conservative input data on corrosion rates, typical estimated lifetimes for vitrified waste blocks are of the order of 10/sup 5/ years. The report concludes with recommendations concerning the most useful areas for further investigations. 256 refs.

49408 **(NAGRA-NTB—83-07) Chemical changes occurring within an intermediate-level waste repository.** (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Jun 1983. 65p. Nagra, CH-5401 Baden, Switzerland.

The 80,000 m/sup 3/ of waste intended for disposal in a Swiss intermediate-level (type B) waste repository contain various materials which can undergo chemical changes. In this report such changes are identified, with special emphasis being given to processes which may be important for the safety assessment of the repository. The type of change which appears most important from this point-of-view is gas formation inside the repository. Three gas generating processes are described and, as far as possible, quantified and represented in terms of a most probable range. The amounts produced are expressed in m/sup 3/ gas at atmospheric pressure. These processes are: Radiolytic decomposition of different materials, primarily decommissioning waste, which could generate approx. 10,000 m/sup 3/ of hydrogen within 20 years. Microbial degradation which can generate 100,000 - 200,000 m/sup 3/ of hydrogen and methane within 200 years. The carbon dioxide generated will be absorbed by concrete if this material is used as an immobilization agent and/or backfill medium. Corrosion, which is the most important gas generating reaction, can produce 200,000 - 1,400,000 m/sup 3/ of hydrogen within 100 years. Enough water for corrosion to occur will be supplied by free water present in the waste and the backfill. Although not treated in detail in this report, the transportation of gas from the repository to the biosphere could take place as a result of gas flow through the fissures in the host rock surrounding the repository. The permeability of the host rock is expected to have the major influence on gas transportation capabilities. Chemical changes within the waste will have an influence on the properties of the barriers used. Changes such as radiolytic decomposition of ion exchange resins, the swelling of such resins and the interaction between concrete and bentonite, are considered.

49409 **(NAGRA-NTB—83-11) Bitumen as a conditioning material for radioactive wastes and its historical analogues.** (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Aug 1983. 40p. (In German). Nagra, CH-5401 Baden, Switzerland.

Bitumen is used for conditioning of low- and intermediate-level radioactive waste. Retention of enclosed material therefore has to be guaranteed for several hundred years. Bitumen can exhibit sufficient long-term stability, as is shown qualitatively using historical analogues of bitumen. Pitch from birch tar found in Switzerland is 5000 years old and resin found in the caverns of Lascaux in France originates from prehistorical times 15,500 years ago.

49410 **(NAGRA-NTB—83-12) Mineralogical investigations of Wyoming bentonite MX-80 and Montigel.** Mueller-Vonmoos, M.; Kahr, G. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1983. 33p. (In German). Nagra, CH-5401 Baden, Switzerland.

A project study for the final disposal of high-level radioactive wastes in deep geological formations, carried out on behalf of Nagra has shown that bentonite could serve as backfilling and sealing material for the final repository concept foreseen by Nagra. Subsequently, the Institute for Foundation and Ground Mechanics of the ETH-Zurich was charged by Nagra with the investigation of various bentonites. The investigations concentrated on the Na-bentonite MX-80 from Wyoming, which is favoured by the Swedes, and on the geographically more favourable Ca-bentonite Montigel from Bavaria. The mineral composition, surface, exchange capacity and exchangeable ions, charge distribution and density of both bentonites have been investigated.

49411 **(NAGRA-NTB—83-15) Final disposal of low- and intermediate-level radioactive wastes in Switzerland: Evaluation of potential site areas. Vol. 1: Bases, evaluation criteria and results.** (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1983. 132p. (In German). Nagra, CH-5401 Baden, Switzerland.

In the years 1978-1981, one hundred repository sites for the disposal of low- and intermediate-level radioactive wastes in Switzerland were evaluated by Nagra. The results are published in Nagra Report NTB 81-04. This led to a selection of 20 potential sites for which further, more detailed clarifications were carried out. The present report contains the summarized results of these clarifications. Three sites of first priority and five sites of second priority have now been short listed.

49412 **(NAGRA-NTB—83-15) Final disposal of low- and intermediate-level radioactive wastes in Switzerland: Evaluation of potential site areas. Volume 2: Appendices and supplements relative to the sites.** (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1983. 115p. (In German). Nagra, CH-5401 Baden, Switzerland.

In the years 1978-1981, one hundred repository sites for the disposal of low- and intermediate-level radioactive wastes in Switzerland were evaluated by Nagra. The results are published in Nagra Report NTB 81-04. This led to a selection of 20 potential sites for which further, more detailed clarifications were carried out. The present report contains the summarized results of these clarifications. Three sites of first priority and five sites of second priority have now been short listed.

49413 **(NAGRA-NTB—83-16) Experiments relating to hydrogen generated by corrosion processes associated with repositories for intermediate-level radioactive wastes.** Schenk, R. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1983. 33p. (In German). Nagra, CH-5401 Baden, Switzerland.

Organic components in an intermediate level waste repository decompose under both aerobic and anaerobic conditions to produce carbon dioxide, which may lead to acid corrosion of metallic containers and hence to hydrogen production. The possibility of hydrogen production within the repository must be considered in determining the long term safety. Thermodynamic calculations show that only pure water is required to produce hydrogen with iron in a repository. The hydrogen evolution rate is thus the important parameter. However, the available kinetic data is insufficient and needs to be supplemented experimentally. Carbon steel specimens were immersed in water over which several gas mixtures containing nitrogen, oxygen and carbon dioxide were passed; the amount of hydrogen picked up by the gas stream was measured. 1.4 - 28 ml hydrogen per square meter per hour was evolved when the gas mixture contained 1 and 20 volume per cent carbon dioxide respectively. Hydrogen was also detected in natural CO/sub 2/-free water when oxygen concentration cells are present. No hydrogen could be detected at pH 8.5 and above. The experiments were all carried out at 25 degrees C and atmospheric pressure and restricted to the carbonate system. Natural waters contain a mixture of salts; this may increase or reduce the hydrogen evolution rate. Higher temperatures and pressures, in particular a higher partial pressure of carbon dioxide, will probably lead to an increase in the hydrogen evolution rate.

49414 **(NAGRA-NTB—84-51) Generation and solidification of radioactive operational wastes in Swiss nuclear power plants.** Della Casa, A.; Caflisch, C.; Bluemel, H. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1984. 85p. (In German). Nagra, CH-5401 Baden, Switzerland.

The report presents a survey of generation and handling of low and intermediate level radioactive wastes in Swiss nuclear power plants. The flow of wastes from the sources of generation to the intermediate storage building on site is shown in simplified diagrams. The waste handling equipment, the characteristics of the solidified radioactive wastes, and the intermediate storage building on site have been described.

49415 **(NAGRA-NTB—86-28) Preliminary study on the use of correlations for controlling important radionuclide concentrations in waste packages.** Degueldre, C.; Huwyler, S. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1986. 39p. Nagra, CH-5401 Baden, Switzerland.

Studies concerning correlations between 'key' nuclides easily detected by high resolution gamma spectrometry and safety relevant radionuclides defined for a reference type B repository are reviewed. This survey allows an evaluation of the control of radionuclide concentrations in the waste from nuclear power plant operation by defining the detection limits of the relevant nuclides. These limits are a function of the 'key' nuclide detection limits, which are themselves dependent on waste package, canister and detection characteristics: that is, isotopic and waste package compositions, shielding, distance between canister and detector, acquisition time and counting efficiency. On the basis of calculations carried out for typical packaged operational wastes from various nuclear power plants, recommendations for the use of correlations and high resolution gamma spectrometry are suggested. In all cases, the determination of the relevant nuclides is possible by correlation because the indirect detection limits of these nuclides are always lower than the concentration limits defined for the Swiss repository for low- and intermediate level activity waste considered in 'Project Gewaehr 1985'.

49416 **(NUREG/CR—2452) Risk methodology for geologic disposal of radioactive waste: Final report.** Cranwell, R.M.; Campbell, J.E.; Helton, J.C.; Iman, R.L.; Longsine, D.E.; Ortiz, N.R.; Runkle, G.E.; Shortencarier, M.J. (Sandia National Labs., Albuquerque, NM (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Engineering Safety). Aug 1987. Contract AC04-76DP00789. 104p. (SAND—81-2573). NTIS, PC A06/MF A01 - GPO. File Number DE87013631.

This report contains risk assessment methodology developed for use in assessing the risk from the disposal of radioactive wastes in deep geologic formations. This methodology consists of techniques for selecting and screening scenarios, models for use in simulating the physical processes and estimating the consequences associated with the occurrence of these scenarios, probabilistic and statistical techniques for use in risk estimates and sensitivity and uncertainty analyses, and a procedure for utilizing these models and techniques to assess compliance with regulatory standards. This methodology is demonstrated by applying it in the analysis of a hypothetical disposal site containing a bedded-salt formation as the host medium for the waste. 68 refs., 24 figs., 14 tabs.

49417 **(NUREG/CR—4654) Radionuclide transport as vapor through unsaturated fractured rock.** Green, R.T.; Evans, D.D. (Arizona Univ., Tucson (USA). Dept. of Hydrology and Water Resources; Nuclear Regulatory Commission, Washington, DC (USA). Div. of Engineering). Jul 1987. 196p. NTIS, PC A09/MF A01 - GPO. File Number DE87900916.

Transport mechanisms potentially important at larger distances include ordinary diffusion, viscous flow, and free convection. Ordinary diffusion includes self and binary diffusion, Knudsen flow, and surface diffusion. Pressure flow and slip flow comprise viscous flow. Free convective flow results from a gas density contrast. Transport mechanisms or processes dominant near the repository include ordinary diffusion, viscous flow plus several mechanisms whose driving forces arise from the non-isothermal, radioactive nature of high-level waste. The additional mechanisms include forced diffusion, aerosol transport, thermal diffusion and thermophoresis. Near a repository, vapor transport mechanisms and processes can provide a significant means of transport from a failed canister to the geologic medium from which other processes can transport radionuclides to the accessible environment. These issues are believed to be important factors that must be addressed in the assessment of specific engineering designs and site selection of any proposed high-level waste repository. 95 refs., 43 figs., 10 tabs.

49418 **(NUREG/CR—4846) High-level waste preclosure systems safety analysis: Phase 2, Final report.** Ligon, D.M.; Stamatelatos, M.G.; Barsell, A.W.; Bolig, C.A. (GA Technologies, Inc., San Diego, CA (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Radiation Programs and Earth Sciences). Jun 1987. Contract AC04-76DP00789. 163p. (SAND—87-7029). NTIS, PC A08. File Number TI87013783.

The original work scope for Phase II was not completed. The major objective was to demonstrate the methodology, developed in Phase I by quantifying a sample problem consisting of a small subset of accident scenarios identified in the first study phase. The purpose of the sample problem is to check the application of the importance ranking scheme on a tractable size of problem, and to illustrate the utility of prioritization for the evaluation of proposed design changes. All the features of the complete analytical technique will be applied including uncertainty and sensitivity analysis, common-cause failure evaluation, and human error contribution. Work included the human reliability analysis, mine-related information search to assemble data on mining equipment and human reliability, common-cause failure analysis, and quantification of accident scenarios selected for the sample problem demonstration. The analysis was based on the conceptual Basalt repository design. 33 refs., 16 figs., 15 tabs.

49419 **(NUREG/CR—4865) The solubility of electrodeposited Tc(IV) oxides.** Meyer, R.E.; Arnold, W.D.; Case, F.I. (Oak Ridge National Lab., TN (USA); Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). Jul 1987. Contract AC05-84OR21400. 20p. (ORNL—6374). NTIS, PC A02/MF A01 - GPO. File Number DE87013034.

Solubilities of electrodeposited Tc(IV) oxides have been determined in solutions of NaCl, HCl, and synthetic groundwater in the pH range 0 to 10. Oxides were electrodeposited onto platinum electrodes, and the oxide-covered platinum placed into a small stirred cell. Solubilities were determined by counting the beta radiation of ^{99}Tc in the solution in the stirred cell. The solubilities are approximately constant in the pH range 3 to 10. The electrodeposited oxides are hydrated and experiments show that they have the composition TcO_2 x nH_2O where n has an average value of 1.63 +- 0.28. The oxides appear to vary in structure and/or composition depending on their method of preparation and history. Solubility products between 10^{-32} and 10^{-33} account for most of the data. 24 refs., 4 figs., 2 tabs.

49420 **(ORNL—5567/R1) FEMWATER: A finite element model of WATER flow through saturated-unsaturated porous media: First revision.** Yeh, G.T. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 261p. NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE87014966.

FEMWATER is designed to treat heterogeneous and anisotropic media consisting as many geologic formation as desired; to consider spatially and temporally distributed as well as point sources/sinks; to accept the prescribed initial conditions or to obtain them by simulating steady state version of the system under consideration; to deal with transient head distributed over the Dirichlet boundary; to handle time dependent fluxes due to pressure gradient varying along the Neumann boundary; to treat time-dependent total fluxes distributed over the Cauchy boundary; to automatically determine variable boundary conditions of evaporation, infiltration, or seepage on the soil-air interface; to include the off-diagonal hydraulic conductivity components in the modified Richards' equations for dealing with cases when the coordinate system does not coincide with the principal directions of the hydraulic conductivity tensor; to provide two options of treating the mass matrix - consistent and lumping; to provide three alternatives of approximating the time derivative term-Crank-Nicolson central difference, backward difference, and mid-difference; to give three options for estimating the nonlinear matrix; to include two options for solving the linearized matrix equations; to include both quadrilateral and triangular elements to facilitate the discretization of the region; to automatically reset time step size when boundary conditions or source/sinks change abruptly; to check the mass balance computation over the entire region for every time step; and to consider cases of axis-symmetrical problems. 30 refs., 17 figs., 3 tabs.

49421 **(ORNL—6386) 3DFEMWATER: A three-dimensional finite element model of water flow through saturated-unsaturated media.** Yeh, G.T. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 317p. NTIS, PC A14/MF A01; 1; GPO Dep. File Number DE87014955.

The 3DFEMWATER model is designed to treat heterogeneous and anisotropic media consisting of as many geologic formations as desired, consider both distributed and point sources/sinks that are spatially and temporally dependent, accept the prescribed initial conditions or obtain them by simulating a steady state version of the system under consideration, deal with a transient head distributed over the Dirichlet boundary, handle time-dependent fluxes due to pressure gradient varying along the Neumann boundary, treat time-dependent total fluxes distributed over the Cauchy boundary, automatically determine variable boundary conditions of evaporation, infiltration, or seepage on the soil-air interface, include the off-diagonal hydraulic conductivity components in the modified Richards equation for dealing with cases when the coordinate system does not coincide with the principal directions of the hydraulic conductivity tensor, give three options for estimating the nonlinear matrix, include two options (successive subregion block iterations and successive point interactions) for solving the linearized matrix equations, automatically reset time step size when boundary conditions or source/sinks change abruptly, and check the mass balance computation over the entire region for every time step. The model is verified with analytical solutions or other numerical models for three examples.

49422 **(ORNL/M—387) Environmental surveillance data report for the first quarter of 1987.** (Oak Ridge National Lab., TN (USA)). Jul 1987. Contract AC05-84OR21400. 70p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87012923.

Over 2000 samples representing more than 6500 analyses and measurements were collected by the Environmental Monitoring and Compliance Department (EMC). Stations, which telemeter 1-minute averaged readings on radiation levels, total rainfall, flows, and water quality parameters around ORNL, also reported data. In addition, three meteorological towers send climatological data to a host computer every 15 minutes. Gross alpha concentrations were elevated at two of the Reservation PAM stations due to a baghouse fire at Y-12, which released some small quantities of uranium in early February. Several water monitoring stations have been added. These include point source outfalls on the NPDES permit that have not been sampled in the past. Discharges of tritium remain high at the Melton Branch 1 monitoring station. This is believed to be due to releases from Solid Waste Storage Area 5. Discharges of total strontium were higher in Melton Branch during the first quarter of 1987 than during the last quarter of 1986. This is probably due to increased rainfall during the first quarter. After one year of operation under the new NPDES permit, ORNL still has frequent noncompliances of chlorine and fecal coliform at the Sewage Treatment Plant. The occurrence of fecal coliform bacteria in the plant is due primarily to the low concentrations of chlorine required under the permit. The Category I and II sampling, under the re-

quirements of the NPDES permit during rainfall, results in frequent noncompliances in total suspended solids. This is not surprising since these categories include runoff from parking lots, and storm and roof drains. The average concentration of ^{90}Sr in milk from all stations in the immediate Oak Ridge area were higher than the fourth quarter of 1986.

49423 **(ORNL/Sub—86-07685/1) Soil mechanics and analysis of soils overlying cavitose bedrock.** Drumm, E.C. (Tennessee Univ., Knoxville (USA). Dept. of Civil Engineering; Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 87p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87014972.

The stability of the residual soils existing at the West Chestnut Ridge Site, Oak Ridge Reservation, Tennessee, was evaluated. The weathered bedrock below this residual soil contains numerous solution cavities, and several karst features were identified. The West Chestnut Ridge site was evaluated with respect to deformation and collapse of the residual soil into the bedrock cavities. A finite element analysis investigated the effects of bedrock cavity radius, thickness of soil overburden, and surface surcharge upon the deformational and stability characteristics of the residual soil. The results indicate that for small cavity radii, the thickness of the soil cover has little effect on the zone of yielded soil. For large cavity radii, a smaller zone of distressed soil occurs under thick soil cover than under thin soil cover. Dimensionless curves are presented to enable the prediction of the vertical extent of the zone of yielded soil for a range of site geometries. Although the thick soil deposits (100 feet or greater) typically found on the ridges result in high stresses adjacent to the cavity, the area of the distressed or yielded soil is small and unlikely to extend to the surface. In addition, the surface deformation or subsidence is expected to be minimal. Thus, the siting of waste facilities on the ridges where the overburden is maximum would tend to reduce the effects of deformation into the cavities. 29 refs., 37 figs., 7 tabs.

49424 **(ORNL/TM—10233) Calculation of the inventory and near-field release rates of radioactivity from neutron-activated metal parts discharged from the high flux isotope reactor and emplaced in solid waste storage area 6 at Oak Ridge National Laboratory.** Kelmers, A.D.; Hightower, J.R. (Oak Ridge National Lab., TN (USA)). May 1987. Contract AC05-84OR21400. 120p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87013365.

Emplacement of contaminated reactor components involves disposal in lined and unlined auger holes in soil above the water table. The radionuclide inventory of disposed components was calculated. Information on the composition and weight of the components, as well as reasonable assumptions for the neutron flux fueling use, the time of neutron exposure, and radioactive decay after discharge, were employed in the inventory calculation. Near-field release rates of ^{152}Eu, ^{154}Eu, and ^{155}Eu from control plates and cylinders were calculated for 50 years after emplacement. Release rates of the europium isotopes were uncertain. Two release-rate-limiting models were considered and a range of reasonable values were assumed for the time-to-failure of the auger-hole linear and aluminum cladding and europium solubility in SWSA-6 groundwater. The bounding europium radionuclide near-field release rates peaked at about 1.3 Ci/year total for /sup 152,154,155/Eu in 1987 for the lower bound, and at about 420 Ci/year in 1992 for the upper bound. The near-field release rates of ^{55}Fe, ^{59}Ni, ^{60}Co, and ^{63}Ni from stainless steel and cobalt alloy components, as well as of ^{10}Be, ^{41}Ca, and ^{55}Fe from beryllium reflectors, were calculated for the next 100 years, assuming bulk waste corrosion was the release-rate-limiting step. Under the most conservative assumptions for the reflectors, the current (1986) total radionuclide release rate was calculated to be about 1.2×10^{-4} Ci/year, decreasing by 1992 to a steady release of about 1.5×10^{-5} Ci/year due primarily to ^{41}Ca. 50 refs., 13 figs., 8 tabs.

49425 **(ORNL/TM—10499) Shale: Measurement of thermal properties.** Gilliam, T.M.; Morgan, I.L. (Oak Ridge National Lab., TN (USA)). Jul 1987. Contract AC05-84OR21400. 135p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE88000004.

Thermal conductivity and heat capacity measurements were made on samples of Devonian shale, Pierre shale, and oil shale from the Green River Formation. Thermal expansion measurements were made on selected samples of Devonian shale. Measurements were obtained over the temperature range of ambient to 473 K. Average values for thermal conductivity and heat capacity for the samples studied were within two standard deviations of all data over this temperature range. 15 refs., 12 figs., 4 tabs.

49426 **(ORNL/TM—10566) Preliminary assessment of the radiological impact for individual waste management areas at the Oak Ridge National Laboratory: Status report.** Sears, M.B. (Oak Ridge National Lab., TN (USA)). Sep 1987. Contract AC05-84OR21400. 97p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000145.

This study estimates the radiological impact (i.e., the potential doses) for individual waste management areas at the Oak Ridge National Laboratory and ranks the areas for remedial action based on the off-site doses that result from these discharges to White Oak Creek. Dose estimates are given for the drinking water pathway based on known discharges from White Oak Dam. Estimates are also made of doses for eating fish caught in the Clinch River near the confluence with White Oak Creek. The results of a search for data concerning the discharges of ^{90}Sr, ^{3}H, ^{137}Cs, and ^{60}Co from individual waste management areas are presented. A qualitative assessment is presented, and areas are ranked for remedial investigation based on the available information. 29 refs., 8 figs., 45 tabs.

49427 **(PNL—6259) Pilot-scale ceramic melter 1985-1986 rebuild: Nuclear Waste Treatment Program.** Koegler, S.S. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1987. Contract AC06-76RL01830. 63p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87014273.

The pilot-scale ceramic melter (PSCM) was subsequently dismantled, and the damaged and corroded components were repaired or replaced. The PSCM rebuild ensures that the melter will be available for an additional three to five years of planned testing. An analysis of the corrosion products and the failed electrodes indicated that the electrode bus connection welds may have failed due to a combination of chemical and mechanical effects. The electrodes were replaced with a design similar to the original electrodes, but with improved electrical bus connections. The implications of the PSCM electrode corrosion evaluation are that, although Inconel 690 has excellent corrosion resistance to molten glass, corrosion at the melt line in stagnant regions is a significant concern. Functional changes made during the rebuild included increases in wall and floor insulation to better simulate well-insulated melters, a decrease in the lid height for more prototypical plenum and off-gas conditions, and installation of an Inconel 690 trough and dam to improve glass pouring and prevent glass seepage. 9 refs., 33 figs., 5 tabs.

49428 **(RHO-PB-SR—10-B-WM-Sep.86) Defense waste and transportation management: Monthly report, September 1986.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Sep 1986. Contract AC06-77RL01030. 114p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87012653.

This report describes the activities of Hanford's waste management program up to September of FY 86. Included are summaries of each of the 18 programs' major achievements up to the date the publication was compiled; achievements for the month of September are listed separately in a few of the division summaries. The objectives of each program are presented at the beginning of each division's section. (TEM)

49429 **(SAND—85-1599) Rates of evaporite deformation: The role of pressure solution.** Borns, D.J. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1987. Contract AC04-76DP00789. 43p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000007.

Evaporite sequences were studied for hazardous waste disposal and hydrocarbon development and storage. Rates of deformation are important in evaluating the long-term performance of different evaporites. Rates are controlled by temperature, differential stress, and active mechanism of deformation for each specific type of evaporite and setting. Strain rates are estimated through in-situ

measurements and the integration of geometric strain analysis and stratigraphic arguments for the time required for the observed deformation to occur. An inherent problem in such calculations is the large extrapolation of rates through time. Specific mechanisms can be determined from petrofabric study, as at the WIPP site, SE New Mexico, where textures indicating that pressure solution was active are observed. Calculations based on experimental data are limited by the relatively poor data on diffusion in intergranular fluids. A variety of grain boundary diffusion models have been used. For gravity-driven deformation near the WIPP site, geometric-stratigraphic integration predicts a naturally occurring strain rates of 10^{-14} s^{-1} to 10^{-16} s^{-1}. Strain rates of 10^{-15} to 10^{-16} s^{-1} are predicted using models for dislocation creep and pressure solution. The rates using two approaches, geometric-stratigraphic and constitutive, are basically in agreement. These rates for the gravity-driven flow structures near WIPP reflect lower temperatures and stresses than salt domes. At the temperatures and stresses estimated for the WIPP flow structures, pressure solution is probably the dominant mechanism, rather than dislocation creep. It remains to be determined where in the transition from transient to steady-state response to an underground excavation in rock-salt pressure solution becomes a major mechanism. 39 refs., 4 figs., 8 tabs.

49430 **(SAND—85-7102) Nevada Nuclear Waste Storage Investigations Project: Conceptual design of facilities for unloading radioactive waste from shipping casks.** Townes, G.A.; Godfrey, W.L.; Anderson, K.J. (BE, Inc., Barnwell, SC (USA); Sandia National Labs., Albuquerque, NM (USA)). Aug 1987. Contract AC04-76DP00789. 67p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87014271.

This report presents the results of a conceptual design study for the development of facilities for unloading high-level waste and spent fuel from shipping casks. The study defines methods, operations, equipment, and layout of facilities for unloading high-level waste and spent fuel casks. Capital and operating cost elements for the facilities are identified to facilitate future cost-assessment activities. The study defines the waste-receipt and handling capabilities and unloading cycle times, a design rationale, a staffing plan, and a description of associated development activities.

49431 **(SAND—86-7130) Laboratory determination of the mechanical, ultrasonic and hydrologic properties of welded tuff from the Grouse Canyon heated block site: Nevada Nuclear Waste Storage Investigations Project.** Board, M.P.; Wilson, M.L.; Voegele, M.D. (Science Applications International Corp., Las Vegas, NV (USA)). Aug 1987. Contract AC04-76DP00789. 97p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87014443.

The mechanical, ultrasonic, and hydrologic properties of samples from the Grouse Canyon Member of the Belted Range Tuff exposed in the GTUF Heated Block Alcove, U12G Tunnel, Nevada Test Site are described. These results are similar to measurements made earlier at Sandia National Laboratories. 12 refs., 37 figs., 17 tabs.

49432 **(SAND—87-0880) Interim results of brine transport studies in the Waste Isolation Pilot Plant (WIPP).** Nowak, E.J.; McTigue, D.F. (Sandia National Labs., Albuquerque, NM (USA)). May 1987. Contract AC04-76DP00789. 83p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87014268.

It is important to have quantitative predictions of brine movement in a radioactive waste repository for performance assessment and for seal design evaluations. A preliminary analysis of the results was begun with a highly idealized fluid flow model for porous media. Our waste collection data for unheated boreholes agreed reasonably well with the brine inflows that were calculated with this model. Agreement was attained using permeability and porosity values that are generally consistent with measured WIPP host rock properties. It was also shown that the WIPP experiments are well within the transient stage of this model. However, the temperature dependence of viscosity, when used in this model, is inadequate to account for the large water collection rates in the heated boreholes. Further model development and additional experiments are needed to understand brine movement in the WIPP, with and without sources of heat. Parametric studies of time, scale, and salt composition are needed. Measurements of pore pressure at intervals within a few meters of WIPP excavations were shown by the model analyses to be important for testing mechanistic hypotheses concerning brine transport. WIPP hydrologic and disturbed zone characterization studies can also contribute to our mechanistic understanding of brine transport to WIPP excavations. 29 refs., 30 figs., 6 tabs.

49433 **(UCRL—53702) Spent Fuel Test-Climax: An evaluation of the technical feasibility of geologic storage of spent nuclear fuel in granite: Final report.** Patrick, W.C. (comp.). (Lawrence Livermore National Lab., CA (USA)). 30 Mar 1986. Contract W-7405-ENG-48. 300p. NTIS, PC A13/MF A01; 1; GPO Dep. File Number DE87014322.

In the Climax stock granite on the Nevada Test Site, eleven canisters of spent nuclear reactor fuel were emplaced, and six electrical simulators were energized. When test data indicated that the test objectives were met during the 3-year storage phase, the spent-fuel canisters were retrieved and the thermal sources were de-energized. The project demonstrated the feasibility of packaging, transporting, storing, and retrieving highly radioactive fuel assemblies in a safe and reliable manner. In addition to emplacement and retrieval operations, three exchanges of spent-fuel assemblies between the SFT-C and a surface storage facility, conducted during the storage phase, furthered this demonstration. The test led to development of a technical measurements program. To meet these objectives, nearly 1000 instruments and a computer-based data acquisition system were deployed. Geotechnical, seismological, and test status data were recorded on a continuing basis for the three-year storage phase and six-month monitored cool-down of the test. This report summarizes the engineering and scientific endeavors which led to successful design and execution of the test. The design, fabrication, and construction of all facilities and handling systems are discussed, in the context of test objectives and a safety assessment. The discussion progresses from site characterization and experiment design through data acquisition and analysis of test data in the context of design calculations. 117 refs., 52 figs., 81 tabs.

49434 **(WINCO—1039) Evaluation of a modified Zirflex process to minimize high-level waste generation at the Idaho Chemical Processing Plant.** Chipman, N.A.; Carleson, T.E. (Westinghouse Idaho Nuclear Co., Inc., Idaho Falls (USA)). Jun 1987. Contract AC07-84ID12435. 61p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87014274.

Extensive laboratory experimentation was conducted to develop a dissolvent suitable for Zircaloy based fuels having a surface oxide coating. Other laboratory experimentation was conducted on the precipitation and solids separation steps of the process. Computer simulation was used to determine the stability and uranium extractability of the output stream, and potential waste volume reduction. From these studies a conceptual flowsheet was developed which could potentially reduce HLW volumes by about 30%. Other process alternatives being investigated achieve equal HLW volume reduction and potentially improve safety of operation. Therefore, the Modified Zirflex process is not presently being considered for further development. 22 refs., 21 figs., 3 tabs.

49435 **A remedial alternative prioritization method.** Richter, S.A.; Travis, C.C. New York, NY; American Institute of Chemical Engineers (1987). 15p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 46A.

This study develops and tests a technique for evaluating and prioritizing alternative remedial actions for hazardous waste sites. The method is based on criteria involving risk, benefit and cost, and identifies the most cost-effective solution to a given remedial problem. Four sites on the Department of Energy's Oak Ridge National Laboratory (ORNL) property in Oak Ridge, Tennessee, were used in a case study to develop and test the method. Results of the case study indicate that even if the cap providing in situ containment must be replaced every 10 years, it is a superior alternative to total excavation of the waste sites.

49436 **Hazardous and radioactive waste: Public health issues and concerns.** Meyer, H.R. New York, NY; American Institute of Chemical Engineers (1987). 10p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 46E.

The Uranium Mill Tailings Remedial Action Project (UMTRAP), managed by the USDOE, requires radioactive materials cleanup at numerous private properties and mill sites throughout the United States. To enhance public relations, Chem-Nuclear Systems (CNSI) and MK-Ferguson Company present a unique training and information program, allowing local individuals to understand and evaluate the relative hazards of the work. This paper describes about the radioactive waste and other hazardous materials and the control programs concerned with these wastes.

49437 **Risk assessment of soil contamination criteria.** Montague, D.F.; Holton, G.A.; King, C.M.; Marter, W.L. New York, NY; American Institute of Chemical Engineers (1987). 25p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 46D.

Waste sites at U.S. Department of Energy facilities often contain many radioactive and nonradioactive contaminants: Remedial actions for these sites are being determined, in part, by the risk the contamination poses to the public. However, it is impractical to analyze every contaminant present, especially when many of these contaminants are at such low concentrations or have such minimal health effects associated with them that they do not pose undue risk to the public. It is therefore necessary to develop a way to screen out unimportant risk contributors in order to focus resources on the likely principal contributors to risk. To determine which wastes should be analyzed at waste sites at the Savannah River Plant, Savannah River Laboratory (SRL) personnel developed a two-step selection procedure for selecting contaminants for analysis at each site. If a contaminant's groundwater or soil concentration exceeded the selection criterion, then the contaminant was selected for further assessment. In addition, wastes disposed in large amounts at a waste site were included for assessment, even if the soil or groundwater characterization data did not indicate their presence.

49438 **Meeting the challenges in managing TMI-2 liquid waste and resolving disposal issues.** Schmitt, R.C.; Brown, G.R.; Ayers, A.L. Jr. (Idaho National Engineering Lab., EG and G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83415). pp 592-596 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—). Contract AC07-76ID01570.

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

This paper describes challenges of decontaminating water resulting from the accident at the Unit 2 of the Three Mile Island nuclear power station, disposing of highly contaminated prefilter liners as commercial low-level wastes, and controlling gas generation in highly loaded, disposable zeolite vessels. Disposal of EPICOR-II prefilter liners necessitated development of the first-of-a-kind, concrete high-integrity containers. Shipment of zeolite vessels for use in a research and development program required developing and testing a catalytic recombiner that controlled gases produced by radiolytic decomposition of interstitial water in the vessels.

49439 **Conceptual design of waste packages for the nuclear waste repository in basalt rock.** Dobson, W.L.; Koch, D.A.; Akins, M.J. (Gilbert/Commonwealth, Inc., Reading, PA). pp 440-445 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

The United States government has established a program for the disposal of spent nuclear fuel and high-level radioactive waste. The Nuclear Waste Policy Act (NWPA) of 1982 requires the first nuclear waste repository to begin receiving high-level radioactive waste in 1998. One of the potentially acceptable sites currently being evaluated is the Hanford Site in the Pasco Basin in the state of Washington where the host rock is basalt. Under the direction of the United States Department of Energy (DOE), Rockwell International's Rockwell Hanford Operations (RHO) has initiated the Basalt Waste Isolation Project (BWIP). The BWIP must design waste packages for emplacement in the repository. This paper reviews the Site Characterization Plan Conceptual Design developed for three BWIP waste packages containing different waste forms, e.g.: pressurized water reactor (PWR) spent nuclear fuel, consolidated PWR spent nuclear fuel, and West Valley High-level Wastes. The waste package designs include provisions for withstanding the geologic environmental conditions, interfacing with handling and assembly equipment, and retrieval after it has been emplaced in the basalt borehole.

49440 **Closure seal for Basalt repository: High level waste containers and closure head.** Jayaraman, N.; Akins, M.J. (Gilbert/Commonwealth, Inc., Reading, PA). pp 431-439 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

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49441 **Proposed structural design criteria for high-level radioactive waste containment for deep geologic disposal.** Eggers, A.G. (Westinghouse Electric Corp., Waste Technology Services Div., Madison, PA 15663-0286). pp 316-321 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

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recommends new design criteria applicable to metallic containment vessel for deep geologic disposal of high-level waste. These criteria provide adequate safety under repository conditions without placing unreasonable requirements on the container or requiring unnecessary wall thickness.

49442 **Evaluation of alternative spent fuel waste package concepts for a repository in Basalt.** Hall, G.V.B.; Nair, B.R. (Westinghouse Electric Corp., Waste Technology Services Div., Madison, PA 15663). pp 322-336 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

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49443 **Buckling design criteria for waste disposal containers.** Mallett, R.H. (Swanson Engineering Associates Corp., 4050 Washington Road, McMurray, PA). pp 185-192 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

This report documents analytical and experimental results from a survey of the technical literature on buckling of thick-walled cylinders under external pressure. Based upon these results, a load factor is suggested for the design of waste package containers for disposal of high level radioactive waste in repositories mined in salt formations. The load factor is defined as a ratio of buckling pressure to allowable pressure. Specifically, a load factor which ranges from 1.5 for plastic buckling to 3.0 for elastic buckling is included in a set of proposed buckling design criteria for waste disposal containers.

49444 **Conceptual defense high-level waste package design for a repository in SALT.** Nair, B.R.; Hall, G.V.B. (Westinghouse Electric Corp., Waste Technology Services Div., Madison, PA 15663-0286). pp 179-184 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

The conceptual waste package design for the current reference defense high level waste form from the Savannah River Plant is presented. The waste package consists of the canisterized waste form and a low carbon steel container which serves as the containment barrier. The design thickness of the container is the sum of the structural thickness required to resist the 15.4 MPa lithostatic pressure and the corrosion allowance necessary to assure that the required structural thickness will exist through the 1000 year containment period. Based on available data and completed analyses, the concept presented in the paper satisfies all Department of Energy and Nuclear Regulatory Commission requirements. In addition, sufficient design maturity exists to provide a basis for the preliminary design. Development programs are identified that will be required to support the waste package design during the licensing process.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 49364, 49365, 49366, 49368, 49370, 49371, 49372, 49373, 49378, 49382, 49383, 49384, 49386, 49387, 49388, 49389, 49390, 49391, 49392, 49393, 49394, 49395, 49403, 49404, 49405, 49406, 49416, 49417, 49419, 49420, 49421, 49422, 49423, 49424, 49425, 49426, 49427, 49428, 49429, 49430, 49431, 49432, 49433, 49434, 49435, 49436, 49437, 49451, 49461, 49463, 49464, 49672

49445 **(PB—87-207569/XAB) Final rule for radon--222 emissions from licensed uranium mill tailings. Background information document. Final report.** (Office of Radiation Programs, Washington, DC (USA)). Aug 1986. 226p. (EPA—520/1-86/009). NTIS, PC A11/MF A01.

This background information report summarizes the health effects of radon-222 and the risk assessment procedure. It describes the source of radon-222 emissions. Estimates of radon - 222 emissions from the existing tailings impoundments are presented. The baseline industry risk assessment for individuals, regional and national populations, and the control techniques and work practices that can be used to reduce radon-222 emissions are described. The resulting emissions after application of these control methods are estimated and a comparison of work practices, costs, and effectiveness is presented.

49446 **(PB—87-210092/XAB) Final rule for radon-222 emissions from licensed uranium mill tailings: response to comments. Final report.** (Office of Radiation Programs, Washington, DC (USA)). 15 Aug 1986. 31p. (EPA—520/1-86/011). NTIS, PC A03/MF A01.

In this document, the Environmental Protection Agency EPA responds to comments received on the proposed rulemaking National Emission Standards for Hazardous Air Pollutants; Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings, published in the Federal Register on February 21, 1986.

49447 **(UCRL—53810) Retention by vegetation of radionuclides deposited in rainfall: A literature summary.** Anspaugh, L.R. (Lawrence Livermore National Lab., CA (USA)). Jun 1987. Contract W-7405-ENG-48. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014276.

Data include the results of experiments with artificial tracers and information from direct measurements of naturally occurring and fallout-produced radionuclides washed out or rained out by storms. Individual measurements of retention varied from negative to over 100%. The conclusion is that a value of 0.4 to 0.5 would be appropriate for average retention, and a value of 1.0 would not be unreasonable if one wished to be conservative, particularly where high vegetation densities might be expected. 35 refs., 16 tabs.

0540 Health And Safety

REFER ALSO TO CITATION(S) 49356, 49376, 49377, 49418, 49428, 50308

49448 **(IAEA-HPRA—13) Health Physics Research Abstracts No. 13. Information on research in progress.** (International Atomic Energy Agency, Vienna (Austria)). May 1987. 235p. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703406.

No. 13 of Health Physics Research Abstracts is the continuation of a series of bulletins published by the IAEA since 1967 and which collect reports from Member States on health physics research in progress or just completed. The present issue contains 370 reports received up to March 1987 and covers the following topics: Personnel monitoring, dosimetry, assessment of dose to man, operational radiation protection techniques, radiation levels, effects of radiation, environmental studies, pathways and monitoring, analysis and evaluation of radiation hazards resulting from the operation of nuclear facilities, radiation accidents and emergency preparedness,

epidemiology of radiation damage, optimization of radiation protection, research programmes and projects.

49449 (INIS-BR—794, pp 2) **National program of conventional industry inspection: implantation- results-evaluation.** Silva, F.C.A. da; Gloria, M.B.; Leocadio, J.C.; Farias, C. (Instituto de Radioprotecao e Dosimetria, Rio de Janeiro, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

49450 (INIS-BR—794, pp 7) **SAPRA: a national laboratory of personnel dosimetry.** Luporini Segundo, S.; Crestana, S.; Mascarenhas, S.R. (SAPRA - Servico de Assessoria e Protecao Radiologica, Sao Carlos, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

49451 **(ORNL/TM—10255) Optimization of sampling for the determination of the mean Radium-226 concentration in surface soil.** Williams, L.R.; Leggett, R.W.; Espegren, M.L.; Little, C.A. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 36p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000043.

This report describes a field experiment that identifies an optimal method for determination of compliance with the US Environmental Protection Agency's Ra-226 guidelines for soil. The primary goals were to establish practical levels of accuracy and precision in estimating the mean Ra-226 concentration of surface soil in a small contaminated region; to obtain empirical information on composite vs. individual soil sampling and on random vs. uniformly spaced sampling; and to examine the practicality of using gamma measurements in predicting the average surface radium concentration and in estimating the number of soil samples required to obtain a given level of accuracy and precision. Numerous soil samples were collected on each six sites known to be contaminated with uranium mill tailings. Three types of samples were collected on each site: 10-composite samples, 20-composite samples, and individual or post hole samples; 10-composite sampling is the method of choice because it yields a given level of accuracy and precision for the least cost. Gamma measurements can be used to reduce surface soil sampling on some sites. 2 refs., 5 figs., 7 tabs.

0550 Safeguards, Inspection, And Accountability

REFER ALSO TO CITATION(S) 49376, 49377, 49390, 49950

49452 **Operating experience with pulsed column holdup estimators.** Ehinger, M.H. (Oak Ridge National Lab., TN). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

Methods for estimation of pulsed column holdup are being investigated as part of the Safeguards Assessment Task of the Consolidated Fuel Reprocessing Program (CFRP) sponsored by the United States Department of Energy at the Oak Ridge National Laboratory. The CFRP was a major sponsor of test runs at the Barnwell Nuclear Fuel Plant during 1980-1981. A considerable amount of measurement data was collected for pulsed columns in the plutonium purification portion of the plant during these tests. These data have been used to evaluate and compare several available methods of holdup estimation. 4 references, 3 figures.

49453 **Application of a leached hull monitoring system in a CANDU type fuel reprocessing facility.** Morsy, S.; Barnes, B.; Szabo, E.; Rabot, G.; Phillips, J. (International Atomic Energy Agency, Vienna, Austria; Los Alamos National Lab., NM). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

A hull monitoring system consisting of an ION-1 electronics unit coupled to an ion chamber and a special Be(γ,n) detector has been assembled for use at a reprocessing facility for CANDU type fuel. Both laboratory and on-site calibrations have been performed. Although the conclusions reached during the implementation stage were based on a limited number of collected data, the equipment provided useful and timely information which enhanced the safeguards effectiveness at the facility. The monitoring system was shown to be capable of meeting the original design criteria, which required an instrument to perform attributes tests on the nuclear material contained in the CANDU fuel hulls. Recommendations for further improvements of the instrument based on its past performance are presented. 2 references.

49454 **Demonstrations of safeguards process monitoring sensitivities.** Ehinger, M.H.; Wachter, J.W. (Oak Ridge National Lab., TN). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

Can process monitoring information be incorporated into safeguards tests? What level of sensitivity to removal of material can be achieved with process monitoring tests? These questions are being answered by a series of tests in United States facilities. These tests involve full scale facilities that simulate operating reprocessing plant conditions with natural or depleted uranium solutions as surrogate feed material. Safeguards systems are in place to detect loss or unauthorized removal of solutions. As part of the tests, actual removals of material from the operating facilities are made. Removals have ranged from several kilograms to a few hundred grams of uranium. For the purpose of the tests, uranium is considered to be plutonium and is the focus of safeguards concerns.

49455 **UF_6 cascade header pipe test loop for international safeguards in a gas centrifuge enrichment plant.** Cooley, J.N.; Fields, L.W.; Swindle, D.W. Jr. (Oak Ridge Gaseous Diffusion Plant, TN). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

A functional UF_6 test loop capable of simulating operating flows, pressures, and pipe deposits characteristic of gas centrifuge enrichment plant piping has been designed and made by the Enrichment Safeguards Program at Martin Marietta Energy Systems, Inc., for use by the International Atomic Energy Agency (IAEA) at its Safeguards Analytical Laboratory (SAL) in Seibersdorf, Austria. The purpose of the test loop is twofold: (1) to enable the IAEA to evaluate and to calibrate enrichment safeguards measurement instrumentation to be used in limited frequency-unannounced access (LFUA) inspection measurements at gas centrifuge enrichment plants, and (2) to train IAEA inspectors in the use of such instrumentation. The test loop incorporates actual sections of cascade header pipes from the centrifuge enrichment plants subject to IAEA inspections. The test loop is described and applications for its use by the IAEA are detailed. By giving the IAEA the in-house capability to evaluate LFUA inspection approaches, to develop inspection procedures, and to train inspectors, the UF_6 cascade header pipe test loop will enable the IAEA to implement successfully LFUA strategy inspections at gas centrifuge enrichment facilities subject to international safeguards inspections. 4 references, 2 figures.

49456 20 ton capacity load-cell-based weighing system for UF_6 cylinder mass verifications. McAuley, W.A.; Huxford, T.J.; Cooley, J.N.; Swindle, D.E. Jr. (Oak Ridge Gaseous Diffusion Plant, TN). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

49457 Application of gas phase sampling of UF_6 cylinders in international safeguards verification. Cardwell, R.G.; Younkin, J.M.; Swindle, D.W. Jr. (Oak Ridge Gaseous Diffusion Plant, TN). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

49458 Physical inventory verification exercise for a highly enriched uranium fabrication facility. Abedin-Zadeh, R.; Augustson, R.H. (International Atomic Energy Agency, Vienna, Austria; Los Alamos National Lab., NM). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

The International Atomic Energy Agency, in collaboration with the United States Support Program (POTAS), has developed and conducted a training exercise simulating a physical inventory verification (PIV) at a highly enriched uranium (HEU) fabrication facility. This exercise is part of a series sponsored by the POTAS programme, including PIVs at light water reactors and plutonium fabrication facilities. The first HEU exercise took place in September 1985 at Los Alamos National Laboratory and a second is scheduled for spring, 1987 at the Commission of the European Communities Joint Research Centre, Ispra. The main objectives of these exercises are: (1) To provide the opportunity for inspectors to test and evaluate the use of non-destructive assay (NDA) equipment and computer software under conditions similar to those found during actual inspections; (2) to use the data generated to evaluate different inspection procedures and strategies; and (3) to exchange ideas on PIV procedures between the three operations divisions. This paper outlines the exercises and presents the details on instrument performance, the quality of the measurement data, and suggestions for improving procedures. 5 references, 8 tables.

49459 Non-destructive analysis of WWER-440 spent fuel using gamma and neutron measurements. Tarvainen, M.; Ekenstam, G. af; Arlt, R.; Barnes, B.; Halbig, J.K.; Phillips, J. (Finnish Centre for Radiation and Nuclear Safety, Helsinki; International Atomic Energy Agency, Vienna, Austria; Los Alamos National Lab., NM). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

Non-destructive assay of WWER-440 type spent fuel assemblies has been carried out at the Loviisa Nuclear Power Station in Finland. Two measurement systems based on passive neutron assay and gross gamma counting were used. In addition, high resolution gamma spectrometry was applied for comparison with the gross gamma results. The measured neutron count rates were corrected to obtain a signal proportional to the ^{244}Cm concentration. Correlation curves between the corrected neutron count rates and the burnup have been established and compared with results obtained by theoretical calculations and in experiments performed by other groups. 7 references, 3 figures, 2 tables.

49460 ION-1 fork measurements on pressurized water reactor spent fuel assemblies. Carchon, R.; Smaers, G.; Verrecchia, G.P.D.; Arlt, R.; Stoyanova, I.; Bosler, G.E.; Satinet, J. (Centre d'Etude de l'Energie Nucleaire, Mol, Belgium; Commission of the European Communities, Luxembourg; International Atomic Energy Agency, Vienna, Austria; Kozloduy Nuclear Power Plant, Bulgaria; Los Alamos National Lab., NM; Tihange Nuclear Power Station, Belgium). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

Field tests at the Tihange 1 Nuclear Power Station on pressurized water reactor (PWR) spent fuel by means of the ION-1 Fork detector are reported. Two detector systems and three electronics systems were used to investigate the same set of fuel assemblies for which there was a large variation in burnup and cooling time. The aim of the exercise was to test the performance of the instrument for inspection purposes and for fuel management. The results are discussed. 3 references, 4 figures, 7 tables.

0560 Legislation And Regulations

REFER ALSO TO CITATION(S) 49353, 49373, 49444

49461 (DOE/RW—0035/1-Vol.2) Monitored retrievable storage submission to Congress: Volume 2, Environmental assessment for a monitored retrievable storage facility. (USDOE Office of Civilian Radioactive Waste Management, Washington, DC). Feb 1986. 722p. NTIS, PC A99/MF A01; 1; GPO Dep. File Number DE87012645.

This Environmental Assessment (EA) supports the DOE proposal to Congress to construct and operate a facility for monitored retrievable storage (MRS) of spent fuel at a site on the Clinch River in the Roane County portion of Oak Ridge, Tennessee. The first part of this document is an assessment of the value of, need for, and feasibility of an MRS facility as an integral component of the waste management system. The second part is an assessment and comparison of the potential environmental impacts projected for each of six site-design combinations. The MRS facility would be centrally located with respect to existing reactors, and would receive and canister spent fuel in preparation for shipment to and disposal in a geologic repository. 207 refs., 57 figs., 132 tabs.

49462 (PNL—3594-Rev.7) International nuclear fuel cycle fact book. Leigh, I.W.; Lakey, L.T.; Schneider, K.J.; Silviera, D.J. (Pacific Northwest Lab., Richland, WA (USA)). Jan 1987. Contract AC06-76RL01830. 228p. NTIS, PC A11. File Number DE87010253.

As the US Department of Energy (DOE) and DOE contractors have become increasingly involved with other nations in nuclear fuel cycle and waste management cooperative activities, a need has developed for a ready source of information concerning foreign fuel cycle programs, facilities, and personnel. This Fact Book was compiled to meet that need. The information contained has been obtained from nuclear trade journals and newsletters; reports of foreign visits and visitors; CEC, IAEA, and OECD/NEA activities reports; proceedings of conferences and workshops; and so forth. Sources do not agree completely with each other, and the data listed herein does not reflect any one single source but frequently is a consolidation/combination of information. Lack of space as well as the intent and purpose of the Fact Book limit the given information to that pertaining to the Nuclear Fuel Cycle and to data considered of primary interest or most helpful to the majority of users.

49463 (DOE/RW—0035/1-Vol.1-Rev.1) Monitored retrievable storage submission to Congress: Volume 1, The proposal. (USDOE Office of Civilian Radioactive Waste Management, Washington, DC). Mar 1987. 43p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87012644.

This document contains Department of Energy's proposal for the construction of a facility for monitored retrievable storage

(MRS). This proposal suggests the construction of an MRS facility at a site on the Clinch River in the Roane County portion of Oak Ridge, Tennessee. The facility will limit the storage capacity at the MRS site to 15,000 metric tons of uranium, and preclude waste acceptance by the MRS facility until a construction authorization for the first repository is received from the Nuclear Regulatory Commission. Included are details of the structural and operational components of the MRS. 6 figs.

49464 **(DOE/RW—0035/1-Vol.3-Rev.1) Monitored retrievable storage submission to Congress: Volume 3, Monitored retrievable storage program plan.** (USDOE Office of Civilian Radioactive Waste Management, Washington, DC). Mar 1987. 172p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87012646.

This document presents the current DOE program objectives and the strategy for implementing the proposed program for the integral MRS facility. If the MRS proposal is approved by Congress, any needed revisions to the Program Plan will be made available to the Congress, the State of Tennessee, affected Indian tribes, local governments, other federal agencies, and the public. The proposal for constructing an MRS facility must include: the establishment of a federal program for the siting, development, construction, and operation of MRS facilities; a plan for funding the construction and operation of MRS facilities; site-specific designs, specifications, and cost estimates for the first such facility; a plan for integrating MRS facilities with other storage and disposal facilities authorized by the NWPA. 32 refs., 14 figs., 1 tab.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

REFER ALSO TO CITATION(S) 49919

0701 Physical Isotope Separation

REFER ALSO TO CITATION(S) 49333, 49976

49465 (IAEA-TECDOC—409, pp 125-131) **Production of isotopes.** Lengyel, T. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The radioisotope production in the Hungarian WWR-S type 5 MW research reactor located at the Central Research Institute for Physics is presented. The choice and preparation of targets, irradiation, processing of irradiated targets and examples of /sup 51/Cr, /sup 60/Co, /sup 99/Mo, /sup 125/I, /sup 131/I, /sup 169/Yb and /sup 192/Ir production are described in this paper. 1 tab.

49466 **(INIS-BR—705) Radioisotope production for using in nuclear medicine, in the IPEN-CNEN/SP - Brazil.** Silva, C.P.G. da. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 1p. (In Portuguese). (CONF-8611184—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703695.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

The importance of radioisotopes used in nuclear medicine is shown. The performance of the cyclotrons model CV-28 and studies about production of /sup 123/I are evaluated. The irradiation of mercury target as well as radioelements for using in nuclear medicine are studied. (M.J.C.).

49467 **(INIS-BR—771) Palladium recovery from electronic scrap.** Granato, M.; Sobral, L.G.S. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 8p. (In Portuguese). (CONF-8510463—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703519.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

The selective extraction of palladium contained in integrated circuits for its purification aiming to obtain a high-purity metal (99.5%) is presented. The follow steps were studied: selective leaching of palladium; the formation of ammonium hexachloropalladate or red salt; the formation of palladium amine solution; the precipitation of the diamino palladous chloride or yellow salt; the calcination of yellow salt to yield palladium metal in a sponge form. The selective extraction of 95% of the palladium content with 99.9% purity, therefore above the market specifications were obtained.

49468 **(INIS-mf—10952) Consultants' meeting on reactor production and utilization of Fluorine-18. Summary report.** Vera Ruiz, H. (ed.). (International Atomic Energy Agency, Vienna (Austria)). Aug 1986. 24p. (CONF-8608194—Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703552.

From Consultants' meeting on reactor production and utilization of Fluorine-18; Heidelberg, F.R. Germany (26 Aug 1986).

The nuclear research reactors with thermal neutron fluxes in the order of 1 x 10/sup 13/cm/sup -2/s/sup -1/ can produce sufficient quantities of fluorine-18 for biomedical applications. The recent improvements in labelling with fluorine-18 via nucleophilic reactions have made it possible to develop efficient synthesis techniques for preparing useful quantities of radiopharmaceuticals, which are of great interest for studying regional metabolic functions with positron emission tomography. Other non-medical activities in the field of pharmacology, toxicology, no-carrier-added syntheses and reaction mechanisms in fluorine chemistry can also conveniently be studied using fluorine-18 as a tracer.

0702 Radiation Sources

REFER ALSO TO CITATION(S) 50038, 50532

49469 **(IAEA-TECDOC—410) Properties of neutron sources. Proceedings of an advisory group meeting held in Leningrad, USSR, 9-13 June 1986.** (International Atomic Energy Agency, Vienna (Austria)). Mar 1987. 430p. (CONF-8606126—). NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411.

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The Conference presentations were divided into sessions devoted to the following topics: white neutron sources, primarily pulsed (6 papers); fast neutron fields (5 papers); Californium-252 prompt fission neutron spectra (14 papers); monoenergetic sources and filtered beams (11 papers); 14 MeV neutron sources (10 papers); selected special application (one paper); and a general interest session (4 papers). Individual abstracts were prepared separately for the papers. Refs, figs, tabs.

49470 (IAEA-TECDOC—410, pp 217-224) **Establishment of simple neutron reference calibrator field using moderated Cf-252 source.** Iwai, S.; Hara, A.; Nakamura, T.; Okubo, T.; Uwamino, Y. (Mitsubishi Atomic Power Industries, Inc., Saitama, Japan. Omiya Technical Inst.; Hazama-Gumi Ltd., Saitama, Japan. Technical Research Inst.; Tokyo Univ., Tanashi, Japan. Inst. for Nuclear Study). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

This paper describes the development and standardization of the neutron fields simply manufactured for detector calibrations used for radiation control and environmental measurement. These fields are the following: (1) bare /sup 252/Cf fission field, (2) iron-moderated /sup 252/Cf field, (3) carbon-moderated /sup 252/Cf field, and (4) polyethylene-moderated /sup 252/Cf field. These fields are most suitable for calibrating the detectors used in and around nuclear and radiation facilities, since the fields are designed to simulate the typical neutron fields in and around the facilities. The direct neutron components of these fields have been standardized by the following two methods: (1) calculation by the ANISN code, and (2) measurements with and without a shadow shield, by

detectors standardized in the national standard field at the Electrotechnical Laboratory (ETL). The neutron emission rates of the / sup 252/Cf source have been calibrated also at ETL. We have standardized the energy spectrum of direct component because of its independency to room size and peripheral structures; the accuracies have also been evaluated to be 20% below 100 keV, 15% at 1 MeV, and 50% above 5 MeV. The fields including room scattered components have also been characterized especially to calibrate the neutron detectors having high sensitivity to low energy room scattered neutrons; because large errors are included in the evaluation of low energy neutron components of the direct component field obtainable by shadow shield subtraction. These two kinds of fields can be situated on the secondary standard fields traceable directly to the primary national standard fields in ETL. 15 refs, 5 figs, 1 tab.

49471 **(INIS-BR—707) Radioisotopes in engineering and industry.** Castagnet, A.C.G. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 7p. (CONF-8611184—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703697.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

The applications of radioisotope techniques in engineering and materials quality control are shown. The inventory of mercury in electrolytical cells, the transit and residence time measurements in several processes and radiotracer control are studied. The radioactive tracers in hydrological problems is evaluated. (M.J.C.).

49472 **(INIS-mf—10953) Advisory group meeting on stable isotope labelled compounds in biomedical studies. Summary report.** Vera Ruiz, H.; Parr, R.M. (eds.). (International Atomic Energy Agency, Vienna (Austria)). Nov 1985. 18p. (CONF-8511302—Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703553.

From Advisory group meeting on stable isotope labelled compounds in biomedical studies; Vienna, Austria (26 Nov 1985).

The programme of the meeting was restricted to topics involving applications of stable isotopes of the lighter elements (H, C, N, O). The current status of stable isotope techniques and applications in nutritional and biomedical studies, the applicability of these techniques in developing countries and the IAEA's future programmes on this topic were discussed. 1 tab.

49473 (INIS-mf—10998, pp 10) **Industrial applications of neutron scattering.** Hill, R.J. (Commonwealth Scientific and Industrial Research Organization, Port Melbourne, Australia. Div. of Mineral Chemistry). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

49474 (INIS-mf—10998, pp 15) **Measurements of residual stress by neutron powder diffraction.** Howard, C.J.; Smith, T.F.; Lambrineas, P.; Finlayson, T.R.; Griffiths, J.R. (Australian Atomic Energy Commission Research Establishment, Lucas Heights; Monash Univ., Clayton, Australia. Dept. of Physics; Monash Univ., Clayton, Australia. Dept. of Materials Engineering). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

0703 Isotopic Power Supplies

REFER ALSO TO CITATION(S) 49753

08 HYDROGEN

49475 (NP—7770269, pp C1-C10) **Hydrogen technology.** Jun 1986. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87770269.

In Project-related experiences by Dornier System Company in the field of energy technology.

Various projects from the research field of 'hydrogen technology' and associated experience with application and operation are reported. These cover: experimental study on the development of high-temperature steam-phase electrolysis; safety aspects of a future European hydrogen technology; safety requirements on and risk analysis of the application of hydrogen in motor vehicle traffic with special reference to metal hydride storage systems; development of a thin-film preparation method for ZrO/sub 2/(Y/sub 2/O/sub 3/) electrolytes on a porous base structure; hydrogen technology for arms technology; stationary and mobile processes for H/sub 2/ production; studies on materials for hydrogen operation; development of hydride storage materials; hydrogen storage in micro hollow glass balls; safety analysis for the infrastructure in case of hydrogen-fuelled motor vehicles participating in traffic and transportation. (HWJ).

0801 Production

REFER ALSO TO CITATION(S) 49248

0808 Properties

REFER ALSO TO CITATION(S) 49998

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 49752

49476 **Effects of external radiant flux and ambient oxygen concentration on nonflaming gasification rates and evolved products of white pine.** Kashiwagi, T.; Ohlemiller, T.J.; Werner, K. (Center for Fire Research, National Bureau of Standards, Gaithersburg, MD 20899). *Combustion and Flame;* **69**: No. 3, 331-346(Sep 1987).

Time-dependent gasification mass flux, sample temperatures, and evolved products (CO, CO/sub 2/, H/sub 2/O, and total hydrocarbons) of thermally thick white pine (approximately 3.8 cm cubes) were measured under the nonflaming condition at thermal radiant fluxes of 2.5-6.9 W/cm/sup 2/ in three different atmospheres of N/sub 2/, 10.5% O/sub 2//89.5% N/sub 2/, and air. Results indicate that ambient oxygen significantly increases the gasification mass flux (for example, at 2.5 W/cm/sup 2/, the mass flux in air increases about three times over the mass flux in nitrogen), sample temperatures (surface temperature in air increases as much as 200°C over that in nitrogen), and char depth, and changes the evolved products distribution (CO/sub 2/ yields in air are about 6-8 times larger than that in nitrogen and CO yields in air are about twice as large as that in nitrogen). Therefore, extreme care is needed to apply results obtained in an inert atmosphere to cases, such as ignition, flame spread, and smoldering, in which a wood sample is exposed to oxygen containing atmospheres.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 49815

49477 **(SERI/SP—231-3126) SERI Biochemical Conversion Program: FY 1986, annual report.** (Solar Energy Research Inst., Golden, CO (USA)). Sep 1987. Contract AC02-83CH10093. 314p. NTIS, PC A14/MF A01; 1; GPO Dep. File Number DE87012278.

The Biochemical Conversion Program is mission oriented; effort is concentrated on technologies that appear to have the greatest potential for being adopted by the private sector to economically convert lignocellulosic materials into high-value liquid transportation fuels, particularly ethanol. The goal of the program

is to develop the technology base for the biochemical conversion of these renewable lignocellulosic resources into fuels. The program is structured to supply the technology for such fuels to compete economically first as an octane booster or fuel additive, and, with additional improvements, as a neat fuel. The objectives of the program are to improve the pretreatment, hydrolysis, and bioconversion processes through research so that ethanol can be produced economically from lignocellulosic biomass; develop technologies to convert the underutilized portions of the lignocellulosic feedstock (xylan and lignin) to high-value liquid transportation fuels; evaluate the performance of the emerging process technologies in the smallest possible scale integrated experiment to assess their readiness for scaleup and to better define research needs; and to transfer the technology to the private sector for rapid commercialization by involving industry in the research process at the earliest possible time.

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 49476, 49752, 50199

13 HYDRO ENERGY

1307 Power-conversion Systems

49478 **(EPRI-AP—5385) Acoustic and vibration techniques for cavitation monitoring: Final report.** Abbot, P. (Atlantic Applied Research Corp., Burlington, MA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 139p. Research Reports Center, Box 50490, Palo Alto, CA 940303. File Number TI88920020.

The results from cavitation monitoring tests of two axial-flow hydroturbines are presented. The approach consists of: (1) externally measuring the acceleration levels at the runner ring, draft tube and penstock; and (2) inferring the equivalent "free-field" acoustic power radiated by the hydroturbine cavitation. The signals are then processed in two ways: by full-wave rectification spectral analysis of the high frequency cavitation noise ("demodulation") and by frequency-band averaging. The spectra from the full-wave rectified signal contains significant cavitation information, including inception, magnitude (severity), number of blades undergoing cavitation, and the occurrence of cavitation due to the interaction of the runner blades with the wicket gates. This technique shows improvement over frequency band averaging. These two approaches provide an absolute measure of the cavitation source strength, thereby providing a means for site-to-site comparisons. A measure of the cavitation unsteadiness is presented. Further, a simple semi-empirical formula presented yields an adequate estimate of the radiated acoustic power from leading-edge sheet cavitation at surcharge condition. 24 refs., 74 figs., 3 tabs.

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 49751

49479 (NP—7770269, pp A1-A40) **Solar energy.** Jun 1986. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87770269.

In Project-related experiences by Dornier System Company in the field of energy technology.

Various projects from the research field of 'solar energy' and associated experience with application and operation are reported. These cover: heat-tube solar absorber (Essen solar house); solar seawater desalination in Jordan; solar desalination in Egypt according to the 'greenhouse' principle; utilization of solar energy for freshwater production using the principle of multi-state flash distillation; solar cold-storage house in Cairo; solar energy utilization for heating and cooling a building; small-sized 10 kW solar power plant; performance and operating behaviour of the 16 kW screw-type expander; solar heat pump; development of simple solar collector; selective solar absorber; development of high-temperature-resistant solar-panel surfaces; sun-tracker systems for focussing solar collectors; gas-cooled 20 MW solar tower-type power plant; solar village Indonesia; photovoltaic power plant in Italy; photo-electrochemical cells; solar-collector test-stand; application of photovoltaic systems in space technology projects. (HWJ).

1401 Resources And Availability

49480 **Solar resource assessments in developing countries.** Maxwell, E.L. (Solar Energy Research Institute, 1617 Cole Blvd., Golden, CO 80401). pp 603 of Proceedings of Intersol 85. Vancouver, BC Canada; Solar Energy Society of Canada (1985). (CONF-850604—).

From INTERSOL '85 - Solar energy--the diverse solution; Montreal, Canada (23 Jun 1985).

The Solar Energy Research Institute (SERI) was invited by the Kingdom of Morocco and the United States Agency for International Development (AID) to prepare a plan for the assessment of solar and wind resources in Morocco. This paper is restricted to the solar part of that plan. A three week inspection tour of Morocco in January 1983 revealed a good network of over 20 meteorological stations, located mostly at airports and seaports. Only two stations were monitoring solar radiation. The Meteorological Service Headquarters Station at Casablanca continuously monitors global horizontal and global diffuse insolation and the agricultural research station at Beni Mellal monitors global horizontal insolation. The solar resource assessment plan developed for Morocco should be applicable to many developing countries which fit the following pattern; a network of meteorological stations exist which monitor percent possible sunshine, wind, precipitation, et al, very little or no historical insolation data are available, and image coverage is provided by one of the global network of geosynchronous weather satellites, e.g., METEOSAT. This plan recommends the use of models and a mobile laboratory to estimate and make short term measurements of spectral characteristics and insolation availability to various collector systems.

1403 Economics

REFER ALSO TO CITATION(S) 49495

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 49477, 49492, 49749, 49752

49481 **(BNL—39083) Light regulation and localization of OEC-33 in maize.** Sutton, A.; Sieburth, L.; Bennett, J. (Brookhaven National Lab., Upton, NY (USA); Georgia Univ., Athens (USA). Dept. of Botany). Aug 1986. Contract AC02-76CH00016. 4p. (CONF-860808—13). NTIS, PC A02. File Number DE87011290.

From 7. international congress on photosynthesis; Providence, RI, USA (10 Aug 1986).

The 33 kDa extrinsic protein of PSII (OEC-33) is synthesized in the cytoplasm as a 39 kDa precursor is transported across the chloroplast envelope and thylakoid membrane and becomes attached to the inner surface of the thylakoid membrane. This protein, along with several other extrinsic and intrinsic polypeptides, forms the oxygen evolving complex of PSII; when the extrinsic proteins are removed from PSII particles by washing with alkaline Tris, oxygen evolution is abolished. Because OEC-33 is a component of PSII, we were interested in determining how closely the accumulation of this protein is coordinated with that of the intrinsic PSII proteins. We have isolated polyspecific antibodies against OEC-33 and have used the antiserum to determine the role of phytochrome and chlorophyll biosynthesis in the accumulation of this polypeptide in maize. During the course of these studies we have obtained information about the localization of OEC-33 in plants grown under conditions where several other components of PSII fail to accumulate. 12 refs., 5 figs.

49482 **(CONF-8706194—1) Biomass research directions in forestry.** Ranney, J.W.; Dawson, D.H. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014054.

From Southern biomass working group; Biloxi, MS, USA (8 Jun 1987).

National and international issues are guiding forestry research more than the knowledge of forest scientists. Major national issues concern competition for land, alternatives to agricultural crops, and erosion. However, the efforts of the research community are dominated by international issues such as acid deposition, competitive technologies on the international market, energy security, and global climate change. Steps are now being taken to improve US plant sciences competitiveness, while more basic research is being included in ongoing programs. 10 refs.

49483 **(CONF-8708127—1) Validation and standardization of SRIC [short-rotation intensive culture] production costs.** Wright, L.L.; Ranney, J.W. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87014799.

From International Energy Agency workshop on economic evaluations of short rotation biomass energy systems; Duluth, MN, USA (11 Aug 1987).

The objective of the Short Rotation Woody Crops Program has always been "to improve the productivity and cost efficiency of growing woody plants for energy." The program has reached the stage now where research results indicating improved productivity and reduced costs can be tested in larger plots. Monoculture Viability Trials ranging in size from 10 to 35 ha are being established in 3 locations with co-funding from industry. One major component of the trials is to accurately determine all costs associated with establishing, maintaining, and harvesting an operational-scale, short-rotation intensive culture plantation. A standardized cost accounting spreadsheet for reporting cost information has been agreed upon by all investigators involved.

49484 **(CONF-8708127—2) Cost objective overview for short rotation woody crops.** Perlack, R.D.; Ranney, J.W. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013677.

From International Energy Agency workshop on economic evaluations of short rotation biomass energy systems; Duluth, MN, USA (11 Aug 1987).

The costs of SRIC feedstocks are evaluated under present state-of-the-art conditions and under two sets of assumptions about anticipated advances in the technology. The results indicate that delivered SRIC feedstock costs using available technology are likely to range between $3.00 and $4.10/GJ depending on the region where grown. Based on estimates of technological advances in genetics, cultural management, and harvesting, delivered costs could be lowered to under $2.00/GJ by the year 2000. 3 refs., 2 figs., 3 tabs.

49485 (NP—7770269, pp F1-F3) **Energy from biomass.** Jun 1986. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87770269.

In Project-related experiences by Dornier System Company in the field of energy technology.

Various projects from the research field of 'energy from biomass' and associated experience with application and operation are reported. These cover: bioconversion - biologico-technical systems for energy production; fermentation alcohol from produce as biofuel; utilization of plant wastes in developing countries; potential of plant materials (especially wood wastes) for raw material production.

49486 **(PB—87-210423/XAB) Interference effects and space-charge-limited conduction in amorphous silicon devices. Doctoral thesis.** den Boer, W. (Technische Hogeschool Delft (Netherlands)). 1983. 122p. (In Dutch). NTIS, PC PC E05/MF E01.

Hydrogenated amorphous silicon (a-Si:H) is a promising material for large-area electronic devices such as solar cells, electrophotographic receptors, and thin-film transistor arrays for matrix liquid-crystal displays. In this thesis, interference effects in a-Si:H solar cells and space-charge-limited conduction in a-Si:H n(+)-i-n(+) structures have been investigated.

49487 **(SAND—87-2135C) Crystalline cell research status and direction.** Arvizu, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 17 Sep 1987. Contract AC04-76DP00789. 14p. (CONF-871112—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87014214.

From 3. international photovoltaic science and engineering conference; Tokyo, Japan (3 Nov 1987).

This paper summarizes the status of crystalline cell research in the program managed by Sandia National Laboratories and sponsored by the US Department of Energy (DOE). Recent advances in high efficiency and program direction are discussed for each of the three program elements which include one-sum crystalline silicon, concentrator silicon, and concentrator III-V material cells. 13 refs., 2 figs. 1 tab.

49488 **Ion beam hydrogenation of amorphous silicon.** Tsuo, Y.S.; Smith, E.B.; Deb, S.K. (Solar Energy Research Institute, Golden, Colorado 80401). *Applied Physics Letters;* **51**: No. 18, 1436-1438(2 Nov 1987). Contract AC02-83CH10093.

A Kaufman ion beam source was used to implant hydrogen atoms into glow-discharge-deposited amorphous silicon materials in which the hydrogen content had been driven out by heating. We found that the hydrogen atoms introduced by this low-energy (less than 700 eV) ion implantation method bonded predominantly as SiH. An air mass one, photo-to-dark-conductivity ratio as high as 5.6×10^5 has been obtained with hydrogen-implanted materials. No light-induced reduction of the photo- and dark conductivities has been observed in these materials after 20 h of AMl illumnination.

49489 **Quantum well multijunction photovoltaic cell.** Chaffin, R.J.; Osbourn, G.C. (to Dept. of Energy, Washington, DC). US Patent 4,688,068. 18 Aug 1987. Filed date 28 Feb 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A monolithic, quantum well, multilayer, multijunction photovoltaic cell is described which consists of: at least two p-n junctions electrically connected to each other; each p-n junction comprising a p-region on one side and an n-region on the other side, each of which regions comprises a series of at least three semiconductors layers, all p-type in the p-region and all n-type in the n-region, the layers forming a strained layer superlattice; each of the series of layers in each p-n junction comprising alternating barrier and quantum well layers, each barrier layer comprising a semiconductor material having a first bandgap when the semiconductor material is in bulk thickness, and each quantum well layer comprising a semiconductor material that has a second bandgap when the semiconductor material is in bulk thickness, the bandgap being narrower then the first bandgap, the barrier layers sandwiching each quantum well layer and each quantum well layer being present in less than bulk thickness and being sufficiently thin that the width of its operational bandgap in each p-n junction is between the first and second bandgaps, the operational bandgap being the effective bandgap of the p-n junction; the operational bandgap of at least one of the p-n junctions being different from that of at least one other p-n junction; whereby radiation incident on the cell and above an energy determined by the operational bandgap of at least one of the p-n junctions will be absorbed and will produce an electrical potential across the junction.

49490 **Tubular luminescence photovoltaic array.** Morris, R.K. (to Secretary of the Air Force, Washington, DC). US Patent 4,687,880. 18 Aug 1987. Filed date 3 Nov 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A photovoltaic solar cell system is described comprising: (a) a hollow light tube of substantially optically transparent material, the tube having preselected length and first and second ends and including four substantially identical walls of preselected width having flat inner intersecting surfaces defining along a central axis a passageway of generally square cross section extending between the ends, the walls having on the outer surfaces thereof a plurality of triangularly shaped grooves extending along the length of the tube, the grooves defining ridges having triangular cross section and extending along the length of the tube, the triangular cross section of

each ridge having an apex angle of 90° and the surfaces of the ridges along the length of the tube defining an angle of 45° with the inner surfaces of the walls; (b) optical means operatively connected to the first end of the tube for directing light into the tube at the first end; (c) solar cells each having a front photoactive surface and a back surface disposed in a rectangular array corresponding in size to the preselected width of the walls and length of the tube, the cells disposed on the outer surfaces of the walls of the tube with the front photoactive surfaces of the cells facing inwardly of the tube.

1407 Solar Thermal Power Systems

49491 **(CONF-870317—2) Modeling of solar pond thermal performance.** Hull, J.R. (Argonne National Lab., IL (USA)). 1987. Contract W-31109-ENG-38. 43p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87011516.

From Solar pond science and technology: a seminar to spread in Latin America the knowledge on solar ponds; Cuernavaca, Mexico (23 Mar 1987).

The utility of solar ponds depends on the amount of thermal energy that the pond can deliver and the cost of constructing and maintaining the pond. Proper engineering of a solar pond requires that the size of the pond be carefully chosen to match the intended load. The thermal performance of a solar pond depends on how much incident solar radiation is collected, how much heat is lost through the gradient zone, how much heat is lost to the ground, the total storage capacity, and the effectiveness of the heat extraction system. The thermal behavior is relatively well understood because it depends basically on heat conduction, and it is much more advanced than the understanding of solar pond hydrodynamic behavior. Several of the different design methods available to predict thermal performance are discussed in this paper.

49492 **(SERI/TP—255-3205) Polymers in solar technologies.** Neidlinger, H.H.; Schissel, P. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1987. Contract AC02-83CH10093. 20p. (CONF-8708139—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88001102.

From International symposium on polymers for advanced technologies; Jerusalem, Israel (16 Aug 1987).

This paper describes some uses of polymeric materials in solar energy collection, identifies limiting problem areas, points out several potential areas of research, and closes with projected areas of future solar application. A key to the successful implementation of the various methods proposed for converting solar energy is the progress made by polymer scientists in developing polymers with the desired properties as well as with resistance to degradation. Polymeric materials offer potentially lower costs, lighter weight, easier processing, and greater design flexibility than materials in current use. However, cost effective design, fabrication, and operation of systems utilizing polymers must be based on a sound understanding of the properties and predicted performance of these materials in service, particularly the optical, thermomechanical, and diffusion barrier behavior and the effects of environmental aging.

1409 Solar Thermal Utilization

49493 **(CONF-870317—3) Integration of solar ponds with agricultural systems.** Hull, J.R. (Argonne National Lab., IL (USA)). Jan 1987. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011517.

From Solar pond science and technology: a seminar to spread in Latin America the knowledge on solar ponds; Cuernavaca, Mexico (23 Mar 1987).

Solar ponds have promise for use in many parts of the agricultural system. The pond design can be adapted for these applications in many different climates. Specific examples are given for grain drying in both temperate and humid tropical conditions, greenhouse and shelter heating, and process heating. The integration of solar ponds into the agricultural system from a social and environmental context is shown to be the major impediment for widespread adaption of this technology. Methods for performing this integration are discussed.

49494 **(PB—87-210464/XAB) Understanding passive cooling systems. Technical paper.** Halacy, D. (Volunteers in Technical Assistance, Inc., Arlington, VA (USA)). 1986. 29p. (VITA/TP—48:6/86). NTIS, PC PC E04/MF A01.

This booklet explains the history of passive cooling, basic theory, cold reservoirs, sun shading, reflection of solar heat, ground cooling, wind cooling, water cooling, evaporative cooling, night cooling of thermal mass, exotic passive-cooling methods, arid and humid climate technologies, and the future of passive cooling.

49495 **Optimal sizing of solar energy systems with uncertain data.** Leigh, R.W. (Solar and Thermal Systems Div., Dept. of Applied Science, Brookhaven National Lab., Upton, NY 11973). pp 531 of Proceedings of Intersol 85. Vancouver, BC Canada; Solar Energy Society of Canada (1985). (CONF-850604—).

From INTERSOL '85 - Solar energy--the diverse solution; Montreal, Canada (23 Jun 1985).

The technical and economic characteristics of solar energy systems incorporating storage and a fuel fired or electric backup system may be quite simply expressed if a particular four parameter equation is used to describe their total annual fuel consumption, as will be demonstrated in detail in the paper. The four parameters are weather, load and equipment specific, which is to say they must be obtained anew for systems with technical differences such as higher efficiency, systems operating in different climates or systems meeting different loads. They are not specific to particular system configurations, that is, to particular amounts of storage capacity or collector area, since they describe the dependence of fuel consumption on these variables. In this paper the author attempts to develop the characteristics of economically optimized solar energy systems and show how the cost of operation depends on the errors in estimating various parameters. It is then easy to demonstrate the high cost of uneconomic design criteria such as 100% solar operation. Then, the costs of operating a system optimized for one set of design parameters under conditions described by a different set of design criteria can be quantified and displayed graphically. For expected ranges of error in parameters such as weather and fuel prices, the costs of errors are quite small over the likely range of errors in most cases.

49496 **The design of solar absorption cooling systems.** Brothers, P.W. (Lawrence Berkely Lab., Univ. of California, Berkeley, CA 94720). pp 88 of Proceedings of Intersol 85. Vancouver, BC Canada; Solar Energy Society of Canada (1985). (CONF-850604—).

From INTERSOL '85 - Solar energy--the diverse solution; Montreal, Canada (23 Jun 1985).

Solar system design has typically been based on monthly average values of daily total radiation and load and empirically derived correlations. However, solar cooling systems design has different requirements. Because of the close correlation between solar radiation and cooling load, and because of the nature of the cooling equipment used, knowledge of heat flow rates is important; the design needs to be based on an analysis of daily load and radiation profiles. The design procedures used for solar heating systems are not appropriate for solar cooling systems. The design process in this paper is given in terms of absorption cooling systems, as those are the only type currently commercially available. However, the method is also applicable to Rankine cycle, desiccant or photovoltaic systems. A design technique is presented based on the use of synthetic weather data and specific design days. The technique has the advantage that it is computationally uncomplicated, and is based on readily available climate data. Instantaneous energy flow rates as well as daily energy totals are considered. A range of design options may be considered without the use of detailed simulations.

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 49490, 49491, 49493

49497 Parabolic dish test site of JPL: History and operating experience. Selcuk, M.K.; Ross, D.L. (Jet Propulsion Lab., 4800 Oak Grove Drive, Pasadena, CA 91109). pp 316 of Proceedings of Intersol 85. Vancouver, BC Canada; Solar Energy Society of Canada (1985). (CONF-850604—).

From INTERSOL '85 - Solar energy--the diverse solution; Montreal, Canada (23 Jun 1985).

The parabolic dish test site (PDTS), located at JPL Edwards Air Force Base, California was operational from September 1978 through June 1984 for the Department of Energy (D.O.E.) for the purpose of testing point focus solar concentrator systems operating at temperatures up to 1427°C (2600°F). Systems developed under JPL's supervision or independently by the industry were tested. The PDTS was equipped with a data acquistion and processing system for data reduction and analysis. The PDTS has played an important role in the parabolic dish solar concentrator development program of D.O.E. Both solar power conversion modules and their components were tested. Test experience has led to the commercial development of highly efficient parabolic dish type concentrator and Stirling engine power modules by private industry.

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

49498 (LALP—87-16) The hot dry rock geothermal energy program. Smith, M.C. (Los Alamos National Lab., NM (USA)). Sep 1987. Contract W-7405-ENG-36. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000070.

The paper presents a simplified description of the Department of Energy's Hot-Dry-Rock program conducted at Fenton Hill, New Mexico. What a hot-dry-rock resource is and what the magnitude of the resource is are also described.

1502 Geology And Hydrology Of Geothermal Systems

49499 (UCRL—15943) High temperature testing of the EDCON borehole gravity housing system conducted at Los Alamos National Laboratories, January 12-18, 1986. (Edcon, Inc., Lakewood, CO (USA); Lawrence Livermore National Lab., CA (USA)). 1986. Contract W-7405-ENG-48. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000749.

A series of tests were conducted on the EDCON borehole gravity meter (BHGM) high temperature sonde. The tests were conducted to determine the suitability of this sonde for logging operations in the Department of Energy Salton Trough test well. 1 ref., 3 figs., 4 tabs.

1503 Geothermal Exploration And Exploration Technology

49500 (DOE/ER/12035—1) Thin films for geothermal sensing: Final report. (Pennsylvania Univ., Philadelphia (USA). Moore School of Electrical Engineering). Sep 1987. Contract AC02-82ER12035. 41p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000154.

The report discusses progress in three components of the geothermal measurement problem: (1) developing appropriate chemically sensitive thin films; (2) discovering suitably rugged and effective encapsulation schemes; and (3) conducting high temperature, in-situ electrochemical measurements. (ACR)

1509 Geothermal Engineering

49501 (DOE/ID/12552—1) Continued research on direct contact heat exchangers: Effects of crystallization: Final report. Jacobs, H.R. (Pennsylvania State Univ., University Park (USA)). Jul 1987. Contract AS07-84ID12552. 26p. NTIS, PC A03. File Number DE87014931.

This report describes a preliminary study to determine whether crystallizer schemes could be effectively used in binary geothermal power plants. An industry and literature search was conducted for models that predict potential scale formation. The results indicated that the theoretical models for predicting not only homogeneous nucleation, but also secondary nucleation are suspect. (ACR)

17 WIND ENERGY

49502 (NP—7770269, pp B1-B7) Wind energy. Jun 1986. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87770269.

In Project-related experiences by Dornier System Company in the field of energy technology.

Various projects from the research field of 'wind energy' and associated experience with application and operation are reported. These cover: assessment of the application potential of wind power plants in developing countries; development of a 5.5 m wind energy converter with vertical axis of rotation; Argentine-German R and D project for wind energy utilization; wind technology programme for GROWIAN; assessment of project approaches from SEP-Columbia; Malaysia energy survey; German-Indian development project for wind power utilization. (HWJ).

1701 Availability (climatology)

49503 (DOE/RL/10336—1) Variability of wind power near Oklahoma City and implications for siting of wind turbines. Kessler, E.; Eyster, R. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1987. Contract AI06-81RL10336;AC06-76RL01830. 116p. (PNL—6293). NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE88000444.

Data from five sites near Oklahoma City were examined to assess wind power availability. Wind turbines of identical manufacture were operated at three of the sites, one of which was also equipped with anemometers on a 100-ft tower. Comprehensive anemometric data were available from the other two sites. The study indicates that the average wind speed varies substantially over Oklahoma's rolling plains, which have often been nominally regarded as flat for purposes of wind power generation. Average wind differences may be as much as 5 mph at 20 ft above ground level, and 7 mph at 100 ft above ground level for elevation differences of about 200 ft above mean sea level, even in the absence of substantial features of local terrain. Local altitude above mean sea level seems to be as influential as the shape of local terrain in determining the average wind speed. The wind turbine used at a meteorologically instrumented site in the study produced the power expected from it for the wind regime in which it was situated. The observed variations of local wind imply variations in annual kWh of as much as a factor of four between identical turbines located at similar heights above ground level in shallow valleys and on hilltops or elevated extended flat areas. 17 refs., 39 figs., 11 tabs.

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 49502, 49503

49504 (DOE/CE/15278—T5) Design and demonstrate a low heat-high volume pump compatible with the AV-YO, Inc., proprietary variable stroke control windmill system: Final report, June 4, 1986 through June 3, 1987. Avery, D.E.; Young, B.F. (AV-YO, Inc., Haleiwa, HI (USA)). 8 Oct 1987. Contract FG01-86CE15278. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000396.

This report summarizes the accomplishments of a project to build, install, and demonstrate a variable stroke pump control and windmill system. The time period covered by this report includes the four quarters between June 4, 1986 to June 3, 1987 as well as the time period from June 3, 1987 to the present.

49505 **(DOE/CE/15279—T5) Build, install and demonstrate a variable stroke pump control and windmill system: Fifth quarterly technical progress report.** Avery, D.E. (AV-YO, Inc., Kaneohe, HI (USA)). 15 Sep 1987. Contract FG01-86CE15279. 93p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87014656.

This report consists of two sets of working drawings for a 14 foot wind-powered pumping system. The drawings are of the variable strike mechanism (VSM) and of the new gear drive (NGD). 42 figs. (JDH)

49506 **(DOE/CE/15279—T6) Build, install, and demonstrate a variable stroke pump control and windmill system: Final report, June 4, 1986 through June 3, 1987.** Avery, D.E. (AV-YO, Inc., Kaneohe, HI (USA)). 8 Oct 1987. Contract FG01-86CE15279. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000395.

This grant, FG01-86CE15279, has been carried out in conjunction with grant FG01-86CE15278 titled "Design and demonstrate a low head - high volume pump compatible with the AV-YO, Inc., proprietary variable stroke control windmill system." The final result of both grants involves one wind powered water pumping system. The purpose of the subject grant has been to construct and test a production prototype of the wind powered pumping system. The report discusses the progress to date and discusses the financial considerations and difficulties in funding this project.

49507 **(DOE/CH/10249—T1) Dynamic response of a 330 kW horizontal axis wind turbine generator.** Redmond, I.; Anderson, C.G.; Jamieson, P. (Southern California Edison Co., Rosemead (USA)). 29 Jun 1987. Contract FC02-85CH10249. 136p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE87014867.

This report is the result of a combined experimental and theoretical study of the dynamic response of a Howden HWR 330/26 wind turbine generator. The work was undertaken with the main aim of extending the knowledge of dynamic loading of wind turbines. 11 refs., 65 figs., 21 tabs.

49508 **(PNL—6248) Measurement in a wind tunnel of the modification of mean wind and turbulence characteristics due to induction effects near wind turbine rotors.** Neff, D.E.; Meroney, R.N. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1987. Contract AC06-76RL01830. 146p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE88000249.

It is the purpose of this report to provide experimental data on the wind field surrounding a single model wind turbine rotor disk. These data should provide an improved physical insight into the induction effects of the air flow as it approaches the wind turbine. This insight should in turn improve an analytical model's predictive capabilities. A scaled model of a horizontal-axis wind turbine (a two-bladed rotor of diameter 53 cm) was placed into the Meteorological Wind Tunnel (MWT) facility at Colorado State University (cross-section width of 183 cm). Four different approach flow conditions were studied: low and moderate turbulence levels (0.1% and 1.5% intensity) at both 6 and 7.6 m/s freestream air velocities. For each of these flow conditions the rotor power coefficient versus tip speed ratio was obtained, and the 3-dimensional velocity field from 3 rotor diameters upwind to 0.5 diameter downwind was tabulated. The power output of the rotor was obtained via a simple prony brake friction device that imparts a torque (measured by the deflection of a spring) to the spinning shaft of the wind turbine. The rotor speed, measured by a strobe light, was observed to vary with load from 900 rpm up to 2100 rpm for the flow conditions described above. The 3-dimensional velocity field was measured via a three-hot-film probe. Details of the measurement techniques are provided. The test program and data results are also given. A short discussion of the implications of this data set is included. 12 refs., 19 figs., 11 tabs.

49509 **(PNL-SA—14517) Input turbulence features at a megawatt-size wind turbine, Medicine Bow, Wyoming.** Connell, J.R.; Morris, V.R.; Hinchee, M.E. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1986. Contract AC06-76RL01830. 14p. (CONF-870210—2). NTIS, PC A02. File Number DE88000098.

From 10. energy sources technology conference and exhibition; Dallas, TX, USA (15 Feb 1987).

In response to recent observations that wind turbulence has a strong effect on wind turbine fatigue life, measurements of turbulent wind velocity profiles have been made at the Medicine Bow, Wyoming, WTS-4 wind turbine site. These measurements were taken at seven levels spanning the WTS-4 rotor height on a single meteorological tower 1.75 rotor diameters upstream of the turbine. Concurrent measurements of rotor response were also made. Analysis of the winds at the Medicine Bow site reveals the influence of atmospheric and geographic conditions on what may at first glance appear to be a 'classic, simple, flat terrain' case. The turbulence data are then analyzed to (1) characterize the wind in terms of fixed-point, single-tower properties and (2) model the wind properties as they would be experienced by points on rotating turbine blades. The STRS-2 model, developed by the Pacific Northwest Laboratory, is used to convert single-tower wind characteristics into those that would be measured from an array of towers arranged in a crosswind line covering the rotor disk. A response function for the flatwise root bending moment of one of the WTS-4 turbine blades is computed using the turbine data and the STRS-2 data. The STRS-2 model provides a substantially improved correlation with wind turbine blade bending moment over other single-tower estimation methods. 14 refs., 10 figs., 1 tab.

49510 **(SAND—87-0838C) Fatigue analysis codes for WECS components.** Sutherland, H.J.; Ashwill, T.D.; Naassan, K.A. (Sandia National Labs., Albuquerque, NM (USA); New Mexico Engineering Research Inst., Albuquerque (USA)). Oct 1987. Contract AC04-76DP00789. 7p. (CONF-871062—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE88000431.

From Windpower '87; San Francisco, CA, USA (5 Oct 1987).

This Manuscript discusses two numerical techniques, the LIFE and the LIFE2 codes, that analyze the fatigue life of WECS components. The LIFE code is a PC-compatible Basic code that analyzes the fatigue life of a VAWT component. The LIFE2 code is a PC-compatible Fortran code that relaxes the rather restrictive assumptions of the LIFE code and permits the analysis of the fatigue life of all WECS components. Also, the modular format of the LIFE2 code permits the code to be revised, with minimal effort, to include additional analysis while maintaining its integrity. To illustrate the use of the codes, an example problem is presented. 10 refs.

49511 **(SAND—87-1131C) An overview of the DOE/SANDIA/USDA vertical axis wind turbine Test Bed project.** Klimas, P.C.; Dodd, H.M.; Clark, R.N. (Sandia National Labs., Albuquerque, NM (USA); Department of Agriculture, Bushland, TX (USA)). 1987. Contract AC04-76DP00789. 7p. (CONF-871062—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000604.

From Windpower '87; San Francisco, CA, USA (5 Oct 1987).

Sandia National Laboratories (SNL) is presently erecting its Department of Energy (DOE) funded 34-m diameter vertical axis wind turbine (VAWT) Test Bed on a Department of Agriculture (USDA) site near Amarillo, Texas. This versatile VAWT, rated at 500 kW in a 12.5 m/s (28 mph) wind, has been designed to demonstrate aerodynamic, structural dynamic, and control strategies intended to improve the effectiveness of VAWT systems. The paper addresses all aspects of this major wind energy project. The need for a turbine in this general physical size range, the choice of a modular fabrication scheme, and the reasons for component materials and subsystems are all discussed. The selection of the Bushland, Texas, site and the motivation behind the involvement of the USDA Agricultural Research Service is described. The SNL organization and management plan assembled to design, procure, erect, and operate the Test Bed is detailed. The technical features in the

areas of aerodynamics, structures, power systems, control philosophies, instrumentation, data acquisition, and data analysis are highlighted. 1 ref., 5 figs.

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 49268, 49852

49512 (CONF-8511303—, pp 119-134) **Refrigeration for a supraconducting 1000 MVA generator.** Nienaber, U.; Stephan, A.; Weber, J. (Linde A.G., Muenchen, Germany, F.R. Werksgruppe TVT). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author discusses the requirements made on the refrigerating system for high-capacity turbogenerators. He presents the block diagram of the refrigerating system, explains the associated tasks, demonstrates the selected process by means of the process flow diagram of the He refrigerator system, describes the major components like loop compressor with oil separator, gas and oil flow, cold box, expansion turbine and process control. (HAG).

49513 **(NMRDI—2-73-4226) A study of waste-heat recovery and utilization at the Raton Public Service Company Municipal Power Plant: Final technical report.** Cunniff, R.A. (New Mexico State Univ., Las Cruces (USA). Physical Science Lab.). Sep 1987. 134p. NTIS, PC A07/MF A01 - New Mexico Research and Development Inst., 1220 South St., Francis Dr., Suite 358, Santa Fe, NM 87501. File Number DE88900026.

In this investigation, the Physical Science Laboratory examined the technical and economic feasibility of utilizing waste-heat or cogenerated heat from the Raton Public Service Company Power Plant in Raton, NM. To assess the technical potential for generating hot water and electricity, a computer simulation model was developed to evaluate turbine and system performance at a wide variety of operating conditions, including raised turbine back pressure. The RPSC funded an engineering design of a system to convert a public school building heating system to circulating hot water supplied by the power plant. A Phase I District Heating Demonstration project was evaluated. A market assessment study was completed to determine the likely number, location, and heat load of potentially economic users of a power plant-based district heating system. A conceptual district heating system was designed and analyzed to determine economics. 25 refs., 12 figs., 33 tabs.

49514 (NP—7770267, pp 173-193) **Time-dependent behaviour of Clausius-Rankine processes for waste heat utilization.** Rueffer, B.; Malobabic, M. (Hannover Univ., Germany, F.R. Inst. fuer Thermodynamik; Hannover Univ., Germany, F.R. Inst. fuer Stroemungsmaschinen). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Heat-power systems using the classical Clausius-Rankine process can be used for converting waste heat to useful mechanical or electric work. This subproject aims at describing the time-dependent behaviour of such systems (comprising feed pump, steam generator, expansion machine and condenser) by a mathematical model which should be as generally applicable as possible so as to cover any types of working fluids, expansion machines and steam generators. This mathematical model will be checked, corrected and corroborated by experiments. To this end, a test circuit is operated using the waste gases of a combustion chamber as a controllable source of heat, and water as the working fluid. The expansion machine is a small-sized high-speed Pelton steam turbine.

49515 (NP—7770267, pp 195-232) **Influence of diffuser configurations on the unstable operating behaviour of a radial-flow compressor.** Kalac, H.; Kaemmer, N. (Hannover Univ., Germany, F.R. Inst. fuer Mechanik; Hannover Univ., Germany, F.R. Inst. fuer Stroemungsmaschinen). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Appropriate disturbance of the function of a compressor system may result in pump vibrations characterized by large pressure amplitudes and flow changes. These pump vibrations are mathematically simulated in part A by calculating system instability in terms of the combination of the dynamic compressor behaviour with the non-stationary flow within the system. Calculation involves application of the conservation laws of the theory of non-stationary thread of flow which are solved with a suitable difference calculus. Part B covers the experiments for studying the influence of radial-flow diffuser configuration on stall limit and, thus, on the stress of the stable operating range at low mass through-puts. In addition, unstable operating behaviour of the compressors is examined for different diffuser configurations. (HAG).

49516 (NP—7770267, pp 233-247) **Improvement of the stability properties of axial-flow compressors by boundary-layer energizing.** Traulsen, D. (Hannover Univ., Germany, F.R. Inst. fuer Stroemungsmaschinen). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Practical usability of the characteristic range of stationary gas turbines is frequently restricted by the stability limit of the axial-flow compressor. Due to excessive deceleration, the local stability of the flow in a compressor stage is jeopardized by stall, which may occur anywhere within the confinement of the flow space. Any methods for improving flow stability will have to be performed on these risk sites. The paper describes the influence of side-wall treatment on the stability of the side-wall boundary layer and the formation of the secondary flow at the blade as obtained through a comparative study of smooth and treated walls. In addition, the paper demonstrates the design and construction of a novel compressor test stand. (HAG).

49517 (NP—7770267, pp 249-264) **Transient behaviour of multi-stage axial-flow compressors at rapid guide blade adjustment.** Bloecker, U. (Hannover Univ., Germany, F.R. Inst. fuer Stroemungsmaschinen). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Multi-stage axial-flow compressors could get a greater working range if 'rotating stall' and 'surge' were detected right in their onset and if rapid control methods were available. This would allow to use the full operating range of the compressor up to its actual stability limit. Subproject B3 within SFB 211 studies and describes methods for clear detection of such instabilities and tests rapid guide-blade adjustment for its possible use as a method for preventing surge in a six-stage test compressor. (HAG).

49518 (NP—7770267, pp 265-286) **Influence of systematic geometry variations of the rotor disk and the diffuser on rotating-stall behaviour in a radial-flow compressor.** Kaemmer, N. (Hannover Univ., Germany, F.R. Inst. fuer Stroemungsmaschinen). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

The working range of high-load radial-flow compressor borders on the stall limit which, if exceeded, often results in rotating stalls which both reduce efficiency and jeopardize the machine.

The study is concerned with the causes and effects of stall phenomena in a radial-flow compressor featuring a vaneless diffuser, and involved test series implemented at different speeds and operating points. Their results are discussed, and the test radial-flow compressor, metrology and test set-up are demonstrated. (HAG).

49519 (NP—7770267, pp 287-306) **Damage detection in turbomachines.** Valero, M.; Suedmersen, U.; Koetzing, P. (Hannover Univ., Germany, F.R. Inst. fuer Kerntechnik; Hannover Univ., Germany, F.R. Inst. fuer Stroemungsmaschinen). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

The research project aims at health monitoring and early detection of damage in components of turbine units. Various signals including pressure fluctuations, solid-matter-borne sound and wave oscillations, are studied for their use in damage detection. The paper describes the associated measurements performed on a three-stage axial-flow compressor and a turbine system in a nuclear power plant and discusses their results. (HAG).

49520 (NP—7770267, pp 307-334) **Study on the vibrational behaviour of turbine rotors with a crack.** Schmalhorst, B.; Hartmann, D. (Hannover Univ., Germany, F.R. Inst. fuer Mechanik). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

This report quotes the pertinent literature to point out that crack models for machine-dynamic calculation of rotors needs to be supported by studies on transient crack behaviour. Tests were performed on model rotors to determine the temporal evolution of cracks. The screen line method is used to establish accurately the cross-sectional areas at different points of time and the associated machine-dynamic properties are determined by metrology. A three-dimensional model for simulating the stiffness at the crack site is developed. A DC potential method applied to the three-dimensional structure is used to determine non-destructively an approximation of crack propagation. Based on a spatial difference calculus, the Laplace differential equation is numerically integrated for the potential field. An iterative predictor-corrector procedure allows modelling of the edges and, hence, of the crack. This method is exemplified by a straight-line crack base. (orig./HAG).

49521 (NP—7770267, pp 335-364) **Double-pulse holography used for damage detection in tubes and cylindrical containers exposed to time-variable forces.** Hajduk, M. (Hannover Univ., Germany, F.R. Inst. fuer Verfahrenstechnik). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Intensive research has been dedicated throughout the last years to further develop non-destructive testing procedures which can be used during operation or within brief operational shut-down periods. Double-pulse holography is used for damage detection which allows to examine surface deformations occurring in the vicinity to cracks or other material flows. The paper describes the pulse-holography method and the associated test facility and discusses the measurement results obtained from tests performed on cylindrical containers and tubes and involving different stresses and strains as well as different wall thicknesses and notch sizes. (HAG).

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REFER ALSO TO CITATION(S) 49257, 49258, 49261, 49262, 49263, 49264, 49265, 49266, 49267, 50194, 50241

49522 **(EPRI-AP—5391) Costs of sulfur emission control systems: Final report.** Ribaudo, F.J.; Parikh, K.; Stor, M. (Ebasco Services, Inc., New York (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Aug 1987. 183p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920013.

Two technologies - SO_2 scrubber retrofits and the repowering of plants with coal gasification - are options to help utilities meet federal emission standards. Although the superior sulfur removal capability of gasification plants may allow retrofitting of fewer plants and the repowered plants would produce considerable additional electricity, gasification plus repowering is not yet economically competitive with scrubber retrofitting. Researchers performed an engineering design/cost study for a nominal 600-MW high-sulfur coal-fired plant in the Midwest. They examined plant performance as well as capital and operating costs for both SO_2 scrubber retrofitting and gasification repowering systems. In comparing the two methods, they assumed that scrubbing would remove 90% of the SO_2, compared with 98.5% for gasification repowering. To properly locate the new facilities, the design called for considerable modifications. Critical modifications for SO_2 scrubber retrofitting included connecting a new flue duct and installing isolation dampers. Plant additions and modifications for the repower case proved far more extensive, and included significant changes to the boiler. Cost estimates showed that the net levelized annual costs of the coal gasification repower option would be almost three times that of the SO_2 scrubber option. This calculation takes into account the fact that a repowered unit produces about 40% more electricity. Additionally, the potentially superior sulfur removal capability of gasification did not appear to outweigh the high cost of implementation. 17 figs., 22 tabs.

49523 **(EPRI-CS—5386) Pulse-jet fabric filters for coal-fired utility and industrial boilers: Final report.** Dean, A.H.; Cushing, K.M. (Southern Research Inst., Birmingham, AL (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 422p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920023.

Pulse-jet fabric filters rely on the filtration of dirty flue gas by the outside surface of the bags, which are then cleaned by a shock wave from an air pulse entering each bag from the top. The shock wave travels down each bag, flexing the bag and dislodging dustcake as it travels the length of the bag downward and then upward. A venturi may or may not be used to enhance the pulse, and cleaning may be on-line or off-line. This study provides a convenient and versatile information base about pulse-jet fabric filters on coal-fired boilers. Features include an overview of the pulse-jet concept, a discussion of the advantages and disadvantages of pulse-jet cleaning, a survey of vendors and design and hardware features of pulse-jet installations, discussion of these design and hardware characteristics for several vendors, case histories of a wide variety of installations as examples, and a list of pertinent references. The most important part of the study is an exhaustive table of pulse-jet installations and their features, sorted several different ways for accessibility. Predominant features of the installations in the list are analyzed and presented in graphic form.

49524 **(PB—87-196507/XAB) Disposal, recycle, and utilization of modified fly ash from hydrated-lime injection into coal-fired utility boilers.** Dahlin, R.S.; Lishawa, C.L.; Clark, C.; Nolan, P.; Kaplan, N. (Southern Research Inst., Birmingham, AL (USA)). May 1987. 28p. NTIS, PC A03/MF A01.

The paper gives results of an assessment of the disposal, utilization, and recycle os a modified fly ash from the injection of hydrated lime into a coal-fired utility boiler. The process, developed as a low-cost alternative for achieving moderate degrees of SO_2 control at coal-fired power plants, is being demonstrated in a 105-MW, coal-fired utility boiler at the Edgewater Station of Ohio Edison Company. Both the laboratory tests and the large-scale dis-

posal study showed that the modified ash can be safely handled and landfilled. The studies showed that the cementitious reactions within the wetted ash can produce a nearly impermeable material, if the ash is properly conditioned and placed. One of the most-promising utilization concepts appears to be synthetic aggregate production for bituminous-pavement applications. One of the most-promising recycle concepts appears to be the use of coarse limestone injection with cyclonic removal of the coarse calcine particles followed by hydration and reinjection. This effectively yields the performance of hydrated lime at the cost of coarse limestone, which is much less expensive.

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REFER ALSO TO CITATION(S) 49299, 49748, 51032

49525 **(DOE/CE/76249—1) Development of a decoupling methodology for on-line detection of system instabilities: Final report, September 1984 to June 1987.** Chow, J.H.; Ilic-Spong, M.; Pai, M.A.; Sauer, P.W.; Winkelman, J.R. (General Electric Co., Schenectady, NY (USA). Systems Development and Engineering Dept.). Jun 1987. Contract AC01-84CE76249. 130p. NTIS, PC A07. File Number DE87013720.

Transient stability is a major concern in power system operation, especially when the loss of synchronism may result in islanding of units and a large generation and load imbalance. We are concerned with transient stability regions and energy margins. The knowledge of these key quantities can be used to operate the power system in an economic and secure fashion. The method of analysis discussed here exploits the slow coherence property in a realistic large power system to achieve a two-time-scale decomposition of the power system model and the energy function. The methodology is particularly suited for the investigation of the slow interarea type of instabilities which impacts on the system security more severely than single machine instabilities. The effect of including detailed machine dynamics on the accuracy of direct methods was investigated and a more reliable procedure is proposed. 198 refs., 100 figs., 28 tabs.

49526 **(EUR—10813-EN) Intercomparison of AC electric power measurements in the European Communities.** Bergeest, R. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.)). 1986. 116p. Commission of the European Communities, Luxembourg. Office of Official Publications of the European Communities.

BCR information. Applied metrology.

Detailed results of intercomparison measurements of electrical power at 120 V, 5 A, power factors 1, 0.5, and 0 inductive and capacitive performed at 53 Hz are reported. Seven calibration laboratories within six countries of the EC participated in the measurements. A thermal wattmeter and a power comparator using a time division type multiplier have been used as transfer instruments and circulated between the laboratories. The calibraiton methods used at the different laboratories are described in detail. The spread of the results is in good agreement with the uncertainty limits stated by the different laboratories. One laboratory however had results outside this range of agreement and subsequently adopted a new method of calibration based on multijunction thermal convector. Two other laboratories had also difficulties at zero power load factor.

49527 **(PNL-SA—14282) LVA [Logger Verification Assistant]: A knowledge-based system for diagnosing faults in digital data loggers.** Laufmann, S.C.; Crowder, R.S. III. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1986. Contract AC06-76RL01830. 23p. (CONF-870258—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000097.

From 3. IEEE conference on artificial intelligence applications; Orlando, FL, USA (22 Feb 1987).

This paper describes a knowledge-based system for diagnosing site installations of digital data loggers used in monitoring electrical end-use loads. This task, known as site verification, is expensive and time-consuming. The process of identifying installation faults is data-intensive, yet requires significant use of heuristic techniques and "rules of thumb." Our system, the Logger Verification Assistant (LVA), performs two of the three phases of the verification task, providing an important first step toward full verification at each site. The system utilizes FORTRAN-based programs to summarize, digest, and statistically analyze the end-use data, then performs a rule-based analysis of the results. It is designed to run autonomously during off-hours, in order to distribute the data processing over time and thus reduce computer contention problems while increasing verification throughput. A description of the application domain, the problem characterization, and the solution design are all presented, along with our conclusions. 8 refs., 3 figs., 2 tabs.

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REFER ALSO TO CITATION(S) 51008

49528 (INIS-mf—10958, pp 31-34) **Prospects and possibilities of using microcomputers in automated control systems of nuclear power plants.** Mitosinka, J.; Korec, J. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Within the automated control systems of nuclear power plants, minicomputers and microcomputers are at present functioning in the control of technological processes, in numerical control, in measurement and evaluation instruments, radiation monitoring, production evaluation, operation assessment, laboratory measurement, etc. The possibility is discussed of their deployment in other areas, mainly for the fulfilment of tasks which had so far been done by large computers. In this sense attention is being focused on three basic modes of microcomputer operation, i.e., their use in the function of a personal computer or computer for off-line data collection or processing, connection to a large computer in the function of a batch-mode or interactive terminal, and in connection with other microcomputers in local microcomputer networks. Also important are tasks linked with text processing and graphics. At present the following microcomputers are available for such work in Czechoslovakia: PMD 85, SM 50/40, SM 50/50, SAPI, IT 20 and TNS. The disadvantage is that neither their hardware nor software are compatible. (Z.M.).

49529 (INIS-mf—10958, pp 62-71) **User system of power production enterprises in a nuclear power plant.** Rudolf, B. (Ceske Energeticke Zavody, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The possibility is being discussed of the deployment of the user system of power production enterprises in Czechoslovak nuclear power plants. The user system is software serving for the computer batch processing of so-called type projects. At present it includes record-keeping and planning of the material and technical supply, of costs and wages, wage analyses, record-keeping and planning of basic means and items of gradual consumption and record-keeping of orders in general. The user system of power production enterprises has already been installed at the Dukovany nuclear power plant. The trends of further development of the system are indicated mainly with regard to the possibility of updating data in the different type projects and the possibility of interactive access to the said data. Briefly described is the following type project which will also be incorporated in the user system. This is an automated system for the identification and record-keeping of conditions of technical work safety. (Z.M.).

49530 (INIS-mf—10958, pp 180-187) **Problems of building terminal and computer networks in nuclear power plants.** Zachar, P.; Uricek, P. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The problem area is discussed of the building of computer networks in Czechoslovak nuclear power plants. The diversity of used computer technology in existing nuclear power plants is one of the biggest problems in the application of any model of local computer network in a nuclear power plant. Large-scale terminal networks are therefore being built. There are no problems with incorporating SMEP computers in terminal networks. The possibilities are characterized of connecting local computer networks with the open sector computer network. In this respect there remains the problem of the local bus to which various types of computers are connected. A special communication module was developed for the use of the TNS microcomputer which serves as a batch terminal. The DAVCO service program is designed for providing the interface between operator and communication program such as not to put great demands on the operator. It allows the operator to give 10 types of commands which can be modified using operands. (Z.M.).

49531 **(INIS-mf—10994) Proceedings of the seventh scientific meeting at San Rafael, 6-10 November 1978.** (Asociacion Argentina de Tecnologia Nuclear, Buenos Aires). 1980. 609p. (In Spanish). (CONF-7811226—). NTIS (US Sales Only), PC A99/MF A01. File Number DE87703762.

From 7. scientific meeting of the Argentine Association of Nuclear Technology; San Rafael, Argentina (6 Nov 1978).

Compilation of 68 papers on a variety of aspects and problems arising from the maintenace, commissioning and operation of Argentina's nuclear power plants and reactors. The subjects are referred, in particular, to reactor components and accesories,including fuel elements and chemical treatment of water, as well as the respective control systems and radiochemistry. (R.J.S.).

49532 **(NUREG—0020-Vol.11-No.1) Licensed operating reactors: Status summary report, Data as of 12-31-86.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Information Resources Management). Sep 1987. 469p. NTIS, PC A20/MF A01 - GPO. File Number DE88900023.

This report provides data on the operation of nuclear units as timely and accurately as possible. This information is collected by the Office of Administration and Resources Management from the Headquarters staff of NRC's Office of Enforcement (OE), from NRC's Regional Offices, and from utilities. The three sections of the report are monthly highlights and statistics for commercial operating units and errata from previously reported data; a compilation of detailed information on each unit, provided by NRC's Regional Offices, OE Headquarters and the utilities; and an appendix for miscellaneous information such as spent fuel storage capability, reactor-years of experience and non-power reactors in the US.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 49614, 49653, 49656, 49697, 49700, 49703, 49704, 49705, 49713, 49724, 49820, 51006, 51009

49533 **(CONF-871013—Summ.) Summary of the fourth conference on United States utility experience in reactor noise analysis.** Fry, D.N. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014411.

From 5. SMORN: international conference on reactor noise; Munich, F.R. Germany (12 Oct 1987).

The fourth informal conference on United States utility experience in reactor noise analysis and loose-part monitoring was held at the Northeast Utilities Service Company offices in Hartford, Connecticut, May 12-14, 1987. Host and general chairman for the meeting was J.V. Persio of Northeast Utilities. This conference provided a forum where utilities could share information on reactor noise analysis on an informal basis. There were about 60 attendees at the meeting representing 10 utilities, 3 reactor vendors, 8 consulting organizations, and 4 universities and research laboratories. Twenty-three papers were presented at the conference, dealing with various aspects of loose-part monitoring, neutron noise analysis, and standards activities.

49534 **(EPRI-NP—5388M) NUPLEX [nuclear utility plant life extension] Project Briefs: Final report.** (Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 25p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920021.

Early EPRI studies and more recent ones co-sponsored by EPRI/DOE provide direct input into the methodology of nuclear plant life extension (NUPLEX). There is substantial additional information, funded by a variety of sources and other programs within EPRI, that affect NUPLEX. This document is intended to draw together much of this information in the form of Project Briefs (PB). NUPLEX Project Briefs is a document containing current technical information regarding nuclear plant life extension. The document presents preliminary guidelines, supporting technology, and technical evaluation methods. Each brief contains a condensation of specific NUPLEX information and provides personal contacts and references for interested readers.

49535 (INIS-mf—10958, pp 50-57) **Constructing a central data base of indexes in the nuclear power plant environment.** Dzida, I. (OKR Ostrava, Czechoslovakia. Automatizace Rizeni). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

An automated information system for managerial staff was developed at the Research Institute for Nuclear Power Plants in Jaslovske Bohunice as an independent information subsystem with the aim of providing managerial staff of the plant with an interactive data bank system. The philosophy consists in the principle of establishing a central data bank of indexes containing major indexes from all functional subsystems and technological processes regardless of their levels of automation. The information subsystem for managerial staff allows to supply to the data base data from arbitrary media, to implement the required computer operations with these data and to provide outputs according to specific criteria in form of printouts or on display. The main contribution of the information system for managerial staff consists in the possibility of making quick changes according to user requirements and mainly in the possibility of interacting with the data base. The design of the project is based on available hardware and software level and some parts of it are already being implemented at the Jaslovske Bohunice plant. Problems are discussed relating to the factual filling of the central data bank, mainly with regard to the content classification of indexes monitored in the data base. (Z.M.).

49536 (IWGFPT—25, pp 55-62) **Characterization of fission product deposits on inside surfaces of BWR cladding.** Ohuchi, A. (Nippon Nuclear Fuel Development Co. Ltd., Oarai, Ibaraki). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

Small samples of Zircaloy cladding prepared from current BWR fuel rods were examined by gamma-ray spectrometry, electron probe microanalysis and X-ray diffractometry to determine the nature of the deposits formed on the inside surfaces of fuel cladding. The amount of cesium transported to the inside cladding surface can be roughly estimated by an empirical equation as a function of burnup and fission gas release fraction. The deposits were identified as containing silver, cadmium, tellurium, iodine, cesium, barium, oxygen and uranium. The cesium to iodine ratio in these deposits seemed to be approximately 1/1. Two types of cesium-tellurium deposits were observed on the inside cladding surfaces. The cesium to tellurium ratio seemed to be approximately 2/10 in tiny nodular deposits, and to be approximately 2/1 in concentrations of more massive deposits. X-ray diffractometry on the inside cladding surfaces showed the presence of uranium dioxide (cubic structure), zirconium dioxide (cubic structure) and zirconium (hcp structure). 4 refs, 4 figs, 2 tabs.

49537 (IWGFPT—25, pp 96-103) **Modelling of the fission product release from irradiated overheated LWR fuel.** Vliet, J. van. (Societe Belge pour l'Industrie Nucleaire, Brussels). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

This paper outlines the modelling work performed at BELGONUCLEAIRE in the frame of the COMETHE code, in order to describe the release of the fission products from LWR fuel, when the latter is overheated after operation at low temperature and high burnup. On basis of a review of high burnup data and power ramp tests, transient grain growth appears to be the most likely mechanism by which intragranular fission products can be transferred towards grain boundaries and fuel rod free volume; it also provides an evident interpretation of the denuded zones observed in irradiated fuel samples. A model is described where the grain growth rate is calculated as a function of fuel vapour pressure and grain boundary gas inventory. The main problem is to estimate the vapour pressure above irradiated fuel, as it results not only from the fuel, but also from the fuel-fission product compounds. Hence, grain growth and fission product release are expected to be quite sensitive to the irradiated fuel chemistry, stressing thus the need for the set-up of a comprehensive data base through ad-hoc international programmes. 29 refs, 7 figs.

49538 (IWGFPT—25, pp 157-167) **International TRANS-RAMP I fuel project.** Mogard, H.; Bergenlid, U.; Djurle, S.; Lysell, G.; Roennberg, G. (Studsvik Energiteknik AB, Nykoeping, Sweden). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The TRANS-RAMP I fuel project at Studsvik, Sweden, was initiated in 1982 as an international cooperation effort to study the kinetics of pellet cladding interactions (PCI) defect formation within pre-irradiated (20 MWd/kg U), non-pressurized, 8x8 standard type BWR test fuel under simulated off-normal, short-time power transients. The power ramp rate selected was the most rapid one of which the Studsvik R2 BWR loop was capable (approx 10 kW/m, sec). The test data permit a tentative interpretation of the PCI failure progression in terms of distinct and well-separated power/time boundaries defining 1) crack initiation at the inside surface of the Zircaloy cladding, 2) through-wall crack penetration and 3) out-leakage of fission products to the water coolant. Crack initiation occurs rapidly, within approximately 10 seconds, through-wall crack penetration within about 1 minute, and out-leakage after some 10 minutes of holding at the peak power level. A general PCI failure boundary can thus be defined by the onset of through-wall cracking which coincides at long hold times with the conventional failure threshold. For power levels substantially above the failure threshold (i.e. more than 5 kW/m) the failure boundary is given as the time to through-wall cracking, which shows only a weak dependence on the ramp terminal power level. The onset of crack initiation seems dependent on ramp rate when compared with the DEMO-RAMP II data. 5 refs, 7 figs, 4 tabs.

49539 **(JAERI-M—86-197) Parameter survey for burnup of high conversion light water reactor lattice.** Akie, Hiroshi; Ishiguro, Yukio; Ido, Masaru. (Japan Atomic Energy Research Inst., Tokyo). Feb 1987. 66p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703618.

Burnup calculations were made on a lattice model for high conversion light water reactor (HCLWR) in order to assess the feasibility of HCLWR concept and to obtain reference data on considering its neutronic characteristics. In these calculations, lattice parameters such as Pu enrichment, moderator to fuel volume ratio and fuel pin diameter are widely and parametrically changed to survey the relations between these parameters and the basic characteristics of the lattice, i.e. burnup, conversion ratio, fissible Pu inventory, void reactivity and so on.

49540 **(NUREG/CR—4219-Vol.4-No.1) Heavy-Section Steel Technology Program: Semiannual progress report for October 1986-March 1987.** Pugh, C.E. (Oak Ridge National Lab., TN (USA); Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). Aug 1987. Contract AC05-84OR21400. 266p. (ORNL/TM—9593-Vol.4-No.1). NTIS, PC A12/MF A01 - GPO. File Number DE87012678.

The Heavy-Section Steel Technology (HSST) Program is an engineering research activity conducted by the Oak Ridge National Laboratory for the Nuclear Regulatory Commission. The Program comprises studies related to all areas of the technology of materials fabricated into thick-section primary-coolant containment systems of light-water-cooled nuclear power reactors. The investigation focuses on the behavior and structural integrity of steel pressure vessels continuing cracklike flaws. Current work is organized into twelve tasks: (1) program management, (2) fracture-methodology and analysis, (3) material characterization and properties, (4) environmentally assisted crack-growth studies, (5) crack-arrest technology, (6) irradiation effects studies, (7) cladding evaluations, (8) intermediate vessel tests and analysis, (9) thermal-shock technology, (10) pressurized thermal-shock technology, (11) Pressure Vessel Research Users' Facility, and (12) shipping-cask material evaluations. 128 refs., 148 figs., 33 tabs.

49541 **(EPRI-NP—4574-CCM-Pt.2-Ch.8) ARMP-02 documentation: Part 2, Chapter 8, SIMULATE-E (Mod. 3) computer code manual.** Cobb, W.R.; Borland, R.S.; Darnell, B.L.; Versteegen, P.L.; Ver Planck, D.M. (Science Applications, Inc., Marietta, GA (USA); Yankee Atomic Electric Co., Framingham, MA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 483p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920026.

This report contains the methods descriptions and user's manual for the light water reactor nodal core analysis computer program SIMULATE-E, Mod. 3. SIMULATE-E yields the distribution of fission power within the core in three-dimensional detail, while including the significant effects of thermal-hydraulics, control systems and fuel depletion on the macroscopic cross sections. All calculations solve for volume average values using a nodalization of the core volume which is limited to equal sized nodes. Several variants of conventional coarse mesh diffusion theory are available as options. The user should expect the code to predict a three-dimensional power distribution showing all of the features of the measured distribution; accuracy should be sufficient to enable effective detailed decision making by the utility staff. Substantial numbers of processing options and favorable benchmarking experience enable effective core follow, core design and licensing analyses for BWRs and PWRs. Descriptions and installation instructions for two SIMULATE-E auxiliary codes, ABLE (Albedo and Boundary Leakage Evaluation) and RODDK-E (Rod Delta-k, EPRI), are also included in this report. The ABLE program uses a one dimension two group diffusion method to calculate the two region reflector boundary conditions to provide initial estimates for the SIMULATE-E albedos. ABLE also determines for use in SIMULATE-E the reflector thermal leakage correction factor. The RODDK-E program provides for rapid estimation of relative control rod worths. It uses a two dimensional one group modified FLARE model. The data for the model is obtained from collapsing the three-dimensional data contained on SIMULATE-E restart files.

49542 **Nuclear capacity preservation.** Mentink, H.W.; Gregor, F.E. (Multiple Dynamics Corp.). pp 285-287 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

The development of any new technology quickly results in "Lessons Learned" that are extremely valuable to the industry. The initial phase of the BWR Pilot Plant Study for Life Extension is nearly complete. We are now at a good point to convey what we have learned about organizing Plant Life Extension activities, and provide utilities with a road map for planning similar efforts. The

BWR Pilot Plant Study for Plant Life Extension was initiated in February 1985. The initial phase of the program will be essentially complete in 1986. The project is co-funded by the Electric Power Research Institute, and the U.S. Department of Energy. Using the method discussed in this paper, utilities have the option and an outline to manage a plant-unique life extension assessment in-house, enabling them to directly control the project and ensure that the objectives are realistic, useful, and achieved. The authors have given this methodology the name "Nuclear Capacity Preservation" to indicate that potential life extension starts long before license expiration, and that benefits can be realized at operating plants through improved preservation while providing for future license extension.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 49438, 49519, 49533, 49534, 49537, 49539, 49540, 49541, 49614, 49615, 49656, 49657, 49658, 49665, 49667, 49669, 49670, 49696, 49698, 49699, 49700, 49701, 49705, 49706, 49707, 49708, 49713, 49715, 49716, 49717, 49724, 49728, 49845, 49853, 51009

49543 **(CNEN-DR-GTT—122/84) Comparison of DNBR estimation methods in the Westinghouse and KWU reactor cores.** Camargo, C.T.M.; Pontedeiro, A.C. (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro. Dept. de Reatores). Nov 1984. 57p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703381.

A method for foreseeing departure from nucleate boiling phenomenon in Westinghouse reator cores (OTΔT- signal for reator shut down) is described. The results from investigations done with the OTΔT system and in the efficiency of different methods used in the Westinghouse and KWU nuclear power plants to estimate thermohydraulic conditions of the PWR reactor cores, are presented. The investigations were done, by support of computer codes. The modifications, purposed by Westinghouse, in the original project of Angra-1 OTΔT system are analysed. (M.C.K.).

49544 **(CONF-870839—4) Microstructural characterization of irradiated PWR steels using the atom probe field-ion microscope.** Miller, M.K.; Burke, M.G. (Oak Ridge National Lab., TN (USA); Pittsburgh Univ., PA (USA). Dept. of Materials Science and Engineering). Aug 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02. File Number DE88000341.

From 3. international symposium on environmental degradation of materials in nuclear power systems: water reactors; Traverse City, MI, USA (30 Aug 1987).

Atom probe field-ion microscopy has been used to characterize the microstructure of a neutron-irradiated A533B pressure vessel steel weld. The atomic spatial resolution of this technique permits a complete structural and chemical description of the ultrafine features that control the mechanical properties to be made. A variety of fine scale features including roughly spherical copper precipitates and clusters, spherical and rod-shaped molybdenum carbide and disc-shaped molybdenum nitride precipitates were observed to be inhomogeneously distributed in the ferrite. The copper content of the ferrite was substantially reduced from the nominal level. A thin film of molybdenum carbides and nitrides was observed on grain boundaries in addition to a coarse copper-manganese precipitate. Substantial enrichment of manganese and nickel were detected at the copper-manganese precipitate-ferrite interface and this enrichment extended into the ferrite. Enrichment of nickel, manganese and phosphorus were also measured at grain boundaries.

49545 **(INIS-BR—788) Experience acquired by Furnas for licensing nuclear power plants.** Silva, A.J.C. da; Xavier, E.E. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 17p. (In Portuguese). (CONF-8605239—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703704.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

The system for licensing of Almirante Alvaro Alberto Nuclear Power Plant-Unit 1 is presented. The process phases for reactor construction and operation are described: preliminary site approval; bases for safety review; partial construction permits; final construction permits; emission of final report of safety analysis; initial operation license and permanent operation license. (M.C.K.).

49546 **(INIS-BR—819) Analysis of environmental impact due to gaseous wastes releasing during Angra-1 operation.** Cruz, E.S. da; Kircher, E. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 15p. (In Portuguese). (CONF-8605239—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703717.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

The results of environmental monitoring, carried out in six terrestrial stations around the Angra-1 reactor are presented. The radiation doses were measured using calcium fluoride thermoluminescent dosemeters. A statistical treatment for data obtained by dosemeters to avoid background radiations was done. (M.C.R.).

49547 **(INIS-BR—829) Development of a safety parameter supervision system for Angra-1.** Silva, R.A. da; Thome Filho, Z.D.; Schirru, R.; Martinez, A.S.; Oliveira, L.F.S. de. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 20p. (In Portuguese). (CONF-8605239—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703725.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

The safety parameter supervision system (SSPS) which is a computerized system for monitoring essential parameters in real time, determining the safety status and emergency procedures for returning normal reactor operation, in case of an anomaly occurrence, is presented. The SSPS consists of three sub-systems: Integrated parameter monitoring system which gives to operators an integrated vision of values of a parameter set, able to detect any deviation of normal reactor operation; safety critical function system which evaluates safety status in terms of a safety critical function set appointed in advance, and in case of violation of any critical function, it initiates the adequate emergency procedure to return normal operation; and safety parameter computer system which carries out the arquirement of analogic and digital control signals of nuclear power plant. (M.C.K.).

49548 (INIS-mf—10958, pp 8-16) **Results of solution of departmental project "Automated control system of nuclear power plants".** Kacmary, S.; Korec, J. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The results are discussed of work being done on the model project of an automated system of control for Czechoslovak nuclear power plants. The decision has been taken to implement at the Jaslovske Bohunice nuclear power plant the project whose aim it is to contribute towards raising the efficiency of power generation, and then to implement it at other Czechoslovak nuclear power plants. The project also includes the drafting of a nuclear power plant information system and a draft system of technical implementation of automated control for nuclear power plants. In the course of this project, programmes were elaborated of the interlinkage and cooperation of existing and planned technical means of computer technology. At the V-1 and V-2 power plants at Jaslovske Bohunice this included the interconnection of computer systems in the unit control room and of the central computer system. (Z.M.).

49549 (INIS-mf—10958, pp 20-25) **Automated information system for the management of nuclear power plants as an integrating component of the automated control system.** Mitosinka, J.; Korec, J. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The concept is described of an automated information system for managerial staff of nuclear power plants as an integrating component of the entire automated system of nuclear power plant control. The information system may be characterized as an open system serving the integration of data bases of subsystems. From the time point of view it may be divided into the operative part which operates on the basis of information with the periodicity

of an hour, a shift, or a day, and information accumulated in decades and months. The system may also include a tactical part which contains the time intervals: a month, a quarter, a year, a five year period, and a strategic part which is concerned with predictions for 5 or 10 years and more. The strategic part of the information system has so far not been dealt with. The operative part comprises mainly the direct control of production and the assessment of the nuclear power plant operation. The tactical part of the information system at present contains 750 indexes in 10 areas such as production activity, maintenance and surveillance, work safety and hygiene, the workforce and wages, material and technical provisions, sales, etc. (Z.M.).

49550 (INIS-mf—10958, pp 26-30) **Implementation of the subsystem "Production control by means of an operative automated information system".** Laurinec, R. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The operative part of an automated system of control of a nuclear power plant may be characterized as an independent subsystem solving the problem area of the operative monitoring of basic indexes relating to production in the time interval of one hour to one month. The second component of the subsystem is the operative evaluation of the operation of the nuclear power plant. This subsystem uses the software of the universal automated information system. Data collection is implemented through 29 display panels. Data is stored in the data bank and serves the calculation of other necessary statistical indexes. These indexes are presented either on a print-out or on display. The volume of the data base is at present limited by the number of manually inputted data and therefore only contains basic data on production. For the future an automated transfer is envisaged of this data into the system with the extension of the data base by further operative indexes from non-production areas. (Z.M.).

49551 (INIS-mf—10958, pp 35-39) **Automated processing of plans of routine repairs and overhauls for the production planning in a nuclear power plant.** Zatkova, H. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The principles are stated for routine repairs and overhauls of reactors and turbogenerators in Czechoslovak nuclear power plants with regard to their periodicity and length of duration. It is stated that automated processing of plans of routine repairs and overhauls of these main production components always observes these principles and still allows to process several variant schedules for the operation of nuclear power plants with roughly the same number of effective days in intervals between the repairs. All types of outputs are processed by automated processing of plans of repairs for individual units, power plants or for whole loclities. Calculations are made on an ES 1055 computer and through the STELA telecommunication system its results may be transmitted directly to the respective workplaces in the power plants which, of course, will have to be provided with a terminal. (Z.M.).

49552 (INIS-mf—10958, pp 40-49) **Implementation of results of science and technology development project "Automated system of nuclear power plant control" at the Bohunice plant.** Tibensky, P. (Atomova Elektraren Bohunice, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The implementation of the automated control system at the Jaslovske Bohunice nuclear power plant is taking place in two stages. In the first stage the main computer centre was built with an ES 1055 M computer which has been in operation since January 1985. In the following year, 6 local network terminals of type ES 7927 were installed and one multiplexer ES 8371 for the control of the network. All the equipment operates reliably, the ES 7039 printers are not so reliable. The weakest element are large-size magnetic disc memories. In the next stage, the construction is envisaged of a terminal network with SM 4-20 and SM 52/11 computers and 7202 terminals. The contribution of the implementation of computer technology so far has been in the field of maintenance where it has allowed to centrally plan repairs of some 15,000 items and to coordinate the activities of sub-contractors. Also positive are results in the field of measurement and control technology where the reliability is being evaluated of some 20,000 measurement circuits and elements, and their preventive maintenance and repairs planned. Briefly summed up are items for further increasing the contribution of the deployment of computer technology in nuclear power plants. (Z.M.).

49553 (INIS-mf—10958, pp 58-61) **Application of software produced within the departmental project at the Dukovany nuclear power plant.** Mejzr, J. (Ceske Energeticke Zavody, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The results are summed up of work on the project of an automated nuclear power plant control system, performed in Czechoslovakia in the years 1977-1985. It is stated that at present 20 projects are available designed to various depth and quality, relating to production control, maintenance, production and supply planning, information system for managerial personnel, various administrative procedures, etc. A brief characteristic is presented of the task whose aim it is to complete all projects for the specific conditions of the Dukovany nuclear power plant. (Z.M.).

49554 (INIS-mf—10958, pp 118-122) **Experience with applying the automated control system to maintenance at the Bohunice nuclear power plant.** Vasko, R. (Atomova Elektraren Bohunice, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The automated system of maintenance control at the V-1 nuclear power plant at Jaslovske Bohunice uses experience gained with the maintenance of the A-1 nuclear power plant. With regard to the range of work operations, maintenance includes inspection, routine repair, overhaul of equipment and replacement. Also observed is the classification of equipment according to whether it may be repaired without reactor shutdown or whether the reactor will have to be shut down. At present the maintenance of the Jaslovske Bohunice nuclear power plant is being processed by an automated control system into five year variable plans of repairs, annual and monthly plans of repairs, plans of shut-downs and a schedule of unit shutdowns. The repair plan includes over 6000 items. (Z.M.).

49555 (INIS-mf—10958, pp 188-194) **Computer network at the Dukovany nuclear power plant.** Gabriel, F. (Jaderna Elektrarna, Dukovany, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Briefly presented are the main components of computer technology which will be available at the nucler power plant in Dukovany at the time of commissioning all four units. All equipment is to operate in the planned computer network. The central computer VK-2M45 basically represents two basic units, each of which has its own 4 MB main memory. It is stated that the relatively good hardware provision of the two-processor complex so far has not found an equivalent software. Each processor is controlled by an independent operating system and basically operated as an independent computer. Reasons are given for the interconnection of the different components of computer technology and factors are summed up which have affected the choice of suitable network architecture. The choice has narrowed to the DERIS-900 system and the architecture of open systems. (Z.M.).

49556 (INIS-mf—10958, pp 195-202) **Computerized information system of the Mochovce nuclear power plant.** Holik, V. (Energoprojekt, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The computer-based information system for the Mochovce nuclear power plant has a hierarchic structure which incorporates SM 1804 microcomputers and SM 1420 minicomputers. With regard to operation it is divided into two levels: the information system at the level of power plant units and the information system t the level of the whole power plant. The information system of a unit provides the collection of information on the technological equipment of each unit for the operative control of the unit and documentation on unit operation. Each unit has its own independent computer information system. The actual nucleus of each unit information system consists of two computer complexes based on SM 1420 twin computers, mutually substitutional. The power plant level information system provides the processing and output of information for personnel in the central control room of the power plant and for other managerial staff. It uses preprocessed information from the unit information systems and direct information from non-unit installations and from dosimetric control rooms of the power plant units. This information system is also based on a computer complex with two SM 1420 computers. (Z.M.).

49557 (INIS-mf—10958, pp 203-210) **Bus-bar control system of the Mochovce nuclear power plant unit.** Friedberger, Z. (Energoprojekt, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The automated system of nuclear power control for the Mochovce plant is based on automated bus type means using micro- and minicomputers. The whole system is divided into three subsystems: the computer-based information system, the system of continuous control (automatic control) and the system of discrete control. The basic control level consists of a zero control level which is implemented using the Czechoslovak DERIS-900 system. This is a universal decentralized modular system for measuring, logical control and automated control of technological processes. The system of continuous control ensures that the value of a given physical parameter is kept within the limits given by the respective operating instruction. The system of discrete control controls all actuators with binary type operation (ON-OFF, opened - closed), the display of the state of such elements, technological protection and failure alarm. (Z.M.).

49558 (INIS-mf—10958, pp 281-285) **Design of expert system for diagnostics of operating states of WWER-440 reactor.** Dach, K.; Houska, Z.; Rygl, J.; Vasa, I. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

A brief description is presented of the development of an expert system of diagnostics of operating states of the WWER-440 reactor. The system is designed as a hybrid system which will allow to evaluate the states of reactor internals both from values measured using "conventional" software and by means of logical programs using expert knowledge bases. The system should have a modular structure which will allow to continuously widen knowledge of the expert system and thereby also possibilities of operator consulting. In the first stage software was developed which evaluates the correctness of the function of sensors of neutron flux and the respective measurement chain. The software was tested during the start-up of the first units of the Dukovany nuclear power plant and the V-2 nuclear power plant at Jaslovske Bohunice. Also constructed was the so-called knowledge base for the main closing valve of the primary circuit of the WWER-440 reactor. Knowledge bases are being prepared for the evaluation of operating states of the reactor core, the diagnostics of steam generators, and for the evaluation of the safety aspects of nuclear power plants. A brief description is presented of the designed hardware for the expert system for the Dukovany nuclear power plant which is based on the prepared IGS 4710 graphic station. (Z.M.).

49559 (INIS-mf—10961, pp 22-28) **Experimental investigation of corrosion fatigue and service life of steam generator tubes with technological defects.** Machek, J.; Kysela, J.; Pacak, J. (Statni Vyzkumny Ustav pro Stavbu Stroju, Bechovice, Czechoslovakia; Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia; Valcovny Trub a Zelezarny, Chomutov, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The permissible crack depth on the inner surface of tubes for WWER-440 steam generatos is 0.07 mm. The tubes are manufactured from austenitic stainless steel of the 08Kh18N10T type with a diameter of 16 mm and thickness of 1.4 mm. The operating conditions given primarily by the overpressure of 12 MPa on the primary side as against 3 to 5 MPa on the secondary side, and a temperature gradient of 250 to 300 degC on the primary side as against 230 to 260 degC on the secondary side vary during operation and may thus be the cause of fatigue crack initiation and propagation, this especially on technological defects on inner tube surfaces. Experimental research of initiation and propagation of fatigue cracks and studies of corrosion fatigue confirmed that with respect to steam generator ilfe, technological defects on the inner tube surface down to a depth of 0.10 mm are permissible. (Z.M.).

49560 (INIS-mf—10961, pp 7-13) **Water regime and corrosion problems of the secondary circuit of WWER type nuclear power plants.** Toman, J. (Vyzkumny Ustav Energeticky, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

Secondary circuit measurements in the V-1 nuclear power plant in Jaslovske Bohunice showed a high iron concentration in feedwater. The inspection of the machinery confirmed that this was the result of erosion corrosion. The steam pipes after the high pressure turbine stage prior to the steam separator, and the pipes of heat steam at the inlet of the first superheater stage were attacked into the largest extent. The steam pipes were repaired by lining with austenitic steel sheets at the most exposed points, and this treatment was incorporated in the production of new equipment for other power plants. Only part of the corrosion product sources in feedwater, however, was removed. Therefore, brass as the material for the condenser pipes was recommended to be replaced with titanium alloys, which would allow increasing the pH value of the secondary circuit water, thus significantly reducing the erosion corrosion in the circuit. Also, the need would be eliminated to use austenitic materials for the secondary circuit pipes and components. In addition, the period of the cleaning of the steam generator secondary side would be extended. (Z.M.).

49561 (IWGFPT—25, pp 35-42) **Chemistry of the fuel-clad gap of a PWR rod.** Burns, W.G.; Potter, P.E.; Rand, M.H.; Cordfunke, E.H.P.; Prins, G.; Johnson, P.A.V. (UKAEA Atomic Energy Research Establishment, Harwell; Netherlands Energy Research Foundation, Petten; UKAEA Springfields Nuclear Power Development Labs.). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The chemical constitution of the Fuel-Clad Gap is anlaysed on the basis of linary and ternary equilibrium systems. Effects of variations in oxygen potentials is examined. Data showed that in all cases, the pressure of iodine, as formed through the considered thermal reactions remains low and is unlikely to cause corrosion cracking of the zircaloy cladding. However, effects of radiations on cesium iodide, mainly fission fragments and energy transfer from highly energetic H/sup +/ ions and metastable radicals will cause dissociations (inelastic collisions) which can result in stationary

iodine pressures sufficient to cause stress corrosion cracking of the zircaloy. 30 refs, 7 figs, 1 tab.

49562 (IWGFPT—25, pp 82-88) **Experience on fission gas release in high burnup fuel rods operating in power plants.** Baron, D.; Houdaille, B.; Trotabas, M.; Raybaud, A. (Fragema, 69 - Lyon, France; CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette, France; Electricite de France/SEPTEN, Lyon). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

In order to investigate fission gas release at high burnup in power reactors and in addition to test reactor experiments, FRAGEMA, CEA, E.D.F. are conducting an extensive program of post irradiation examination on rods extracted from E.D.F. commercial reactors. This program includes 3.1% enriched fuel rods operating at nominal power level (180-220 W/cm max rod average) up to 55,000 MWd/tU rod average (collaboration between FRAGEMA, CEA, EDF, WESTINGHOUSE) during 5 twelve month cycles, 4.5% enriched fuel rods and Gd/sub 2/O/sub 3/ rods (collaboration FRAGEMA, CEA, EDF). After irradiation, some of these rods are sent to CEA hot cells for examinations or refabrication (FABRICE process) in order to investigate fission gas release during transient conditions in a test reactor. The purpose of this paper is to present this program, lasting a period of several years, and the first results obtained on the 3.1% enriched fuel rods. The FRAGEMA fuel rods, currently irradiated in the E.D.F. power plants, show a very low fission gas release - of the order of 0.5% - after 4 cycles (45,000 MWd/tU rod average). The first results on 5 cycle rods (55,000 MWd/tU rod average) show that release rate increases with burnup but the absolute value stays low compared to test reactor rods (below 1.5%). The four assemblies with 4.5% enriched rods completed their second cycle of irradiation at midsummer 1985, and their expected average discharge burnup after four cycles is 45,000 MWd/tU. Rods will be examined after two, three and four cycles, and assemblies may be reloaded for a fifth. First results will be available in 1986. In addition, two short rods have been refabricated from two rods irradiated in the Fessenheim power plants for 3 and 4 cycles (35,000 and 45,000 MWd/tU rod average burnup). These rods will be reirradiated in the SILOE test reactor in Grenoble and fission gas release will be continuously monitored. 9 refs, 7 figs, 1 tab.

49563 (IWGFPT—25, pp 89-96) **French experiments on fission product release under normal and off-normal PWR conditions.** Charles, M.; Lemaignan, C. (CEA Centre d'Etudes Nucleaires de Grenoble, 38, France. Dept. de Metallurgie). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

A review is given of the experiments conducted at GRENOBLE on fission product behaviour in PWR fuels. It includes results on fission gas and halogen release during various operating conditions (steady state, transients and accidents). The effects of burn-up, fuel microstructure and design, and irradiation history are developed. Based on several experimental programmes, and especially those dealing with pile-irradiated short fuel rods (Cyrano, Contact, Cansar, Edith, Crusifon, Flash, Heva), those results are compared and the general trends are explained with the support of fuel microstructure observation after various irradiation schemes, up to burn-ups of 60,000 MWd/T. 21 refs, 7 figs, 1 tab.

49564 (IWGFPT—25, pp 103-107) **Study of fission products release from failed fuel elements of light water reactors.** Lusanova, L.M.; Slavyagin, P.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

This paper describes the main results of studies on the characteristics of radioactive fission products release from a dioxide fuel element used in VVER-1000 reactors during experiments with failed fuel elements on one of the MR reactor loops. The investigations were carried out for specified thermal loads in conditions simulating an operation of fuel elements in the reactor over main parameters (pressure, coolant temperature, etc.). A part of the experiment was focused on the study of fission products release from regions of uranium dioxide structural changes. To obtain impressive results special precautions were taken, ruling out the effect of fission products release from radially peripheral fuel regions and fission products migration over a radial gap between a fuel and a cladding. 3 refs, 3 figs.

49565 (IWGFPT—25, pp 108-120) **Release of the volatile fission products Xe, Kr and Cs from PWR fuel under steady and transient conditions up to high burnup.** Sontheimer, F.; Dewes, P.; Manzel, R.; Stehle, H. (Kraftwerk Union A.G., Erlangen, Germany, F.R.). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The release and redistribution of Xe, Kr and Cs in PWR fuel rods was determined by standard techniques. Measurements of the integral release, of the local radial release profiles and of the Gamma-activity profiles were performed. Extensive ceramography and fuel microstructural examinations were the basis for a correlation of the fission product release characteristics and fuel microstructural changes. The burnup of the fuel examined ranged between 5 GWd/tU and 53 GWd/tU. The transient power was in the range of 350 W/cm to 550 W/cm. Steady state release and transient release show many common features. Both occur in the hot fuel center and are closely related to gas bubble precipitation and interlinkage at the grain boundaries. The release shows a strong dependence on the fuel temperature which is influenced by the pellet to clad gap and a certain dependence on grain size especially for transient conditions. Also, it gradually increases with burnup. The burnup influence is moderate and seems to be mainly explained by the increasing amount of absolute gas and corresponding earlier gas bubble interlinkage. Steady state release is low in general (a few per cent). Transient release can be much higher and up to medium burnup it can be described by a simple annealing type Booth model combined with an interlinkage approach. For high burnups, transient release starts with a burst of grain boundary gas. Whereas steady state release at low temperatures (< or approx. 1200 deg. C) seems to be different for Xe and Cs (less Cs release), at high temperatures (> or approx. 1200 deg. C) the radial release profiles of Xe and Cs are similar for both steady state and transient release. This is in agreement with out pile annealing experiments. 15 refs, 19 figs, 2 tabs.

49566 (IWGFPT—25, pp 167-172) **Studies of radiation-thermal decomposition of caesium iodide and stress corrosion cracking of VVER fuel clads on gamma-irradiation.** Bibilashvili, Yu.K.; Vladimirova, M.V.; Golovnin, I.S.; Kulikov, I.A.; Novikov, V.V.; Sotnikov, A.S. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow, USSR). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The paper presents experimental data on the accumulation of iodine that is produced by γ-irradiation of caesium iodide on the inner surfaces of Zr-1% Nb clads. Studies were made into the effect of a gas atmosphere (helium), temperature and irradiation on iodine accumulation. It is established that a rise of temperature and pressure and increased irradiation dose favour iodine accumulation. Iodine produced by radiation-thermal decomposition of CsI in an inert atmosphere is responsible for stress corrosion cracking of clads. 8 refs, 8 figs.

49567 (JAERI-M—86-178, pp 45-100) **Reactor physics experiments and theoretical investigations for tight lattice light water reactors.** Chawla, R. (Swiss Federal Inst. for Reactor Research, Wuerenlingen, Switzerland). Dec 1986. NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

In spite of the relatively poor fuel utilization characteristics of standard light water reactors, they have continued to dominate nuclear energy scene worldwide. As the large scale commercial deployment of fast breeder reactors is not expected for several decades, the modification of LWRs for increasing the conversion ratio and thereby improving fuel utilization has been given serious consideration in various countries. The commonly pursued light water high conversion reactor concept is that using tight lattice, PuO/sub 2/-UO/sub 2/ fuel cores for pressurized water reactors, in which emphasis has been placed on achieving a conversion ratio not less than 0.9, while retaining the existing PWR technology as much as possible. The studies indicated the feasibility of the concept, but the most important problem which lacks the experimental evidence is the reactor physics. The first phase of the experiment in a thermally driven, zero power reactor facility, PROTEUS, was the first measurement related to the physics design of high conversion reactors. The measurement with the SNEAK fast reactor at KfK-Karlsruhe, two experimental programs in progress in CEA/EdF of France and PROTEUS Phase-2 in Switzer land and so on are reported. (Kako, I.).

49568 (JAERI-M—86-195) **Two-dimensional thermal-hydraulic behavior in core in SCTF Core-II forced feed reflood tests. Effects of radial power and temperature distributions.** Iwamura, Takamichi; Sobajima, Makoto; Okubo, Tsutomu; Ohnuki, Akira; Abe, Yutaka; Adachi, Hiromichi. (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. 195p. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703616.

Major purpose of the Slab Core Test Program is to investigate the two-dimensional thermal-hydraulic behavior in the core during the reflood phase of a PWR-LOCA. It was revealed in the previous Slab Core Test Facility (SCTF) Core-II test results that the heat transfer was enhanced in the higher power bundles and degraded in the lower power bundles in the non-uniform radial power profile tests. In order to separately evaluate the effect of the radial power (Q) distribution itself and the effect of the radial temperature (T) distribution, four tests were performed with steep Q and T, flat Q and T, steep Q and flat T, and flat Q and steep T. Based on the test results, it was concluded that the radial temperature distribution which accompanied the radial power distribution was the dominant factor of the two-dimensional thermal-hydraulic behavior in the core during the initial period. Selected data from these four tests are also presented in this report. Some data from Test S2-12 (steep Q, T) were compared with TRAC post-test calculations performed by the Los Alamos National Laboratory.

49569 (JAERI-M—86-196) **COBRA/TRAC analysis of two-dimensional thermal-hydraulic behavior in SCTF reflood tests.** Iwamura, Takamichi; Ohnuki, Akira; Sobajima, Makoto; Adachi, Hiromichi. (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. 105p. NTIS (US Sales Only), PC A06/MF A01. File Number DE87703617.

The effects of radial power distribution and non-uniform upper plenum water accumulation on thermal-hydraulic behavior in the core were observed in the reflood tests with Slab Core Test Facility (SCTF). In order to examine the predictability of these two effects by a multi-dimensional analysis code, the COBRA/TRAC calculations were made. The calculated results indicated that the heat transfer enhancement in high power bundles above quench front was caused by high vapor flow rate in those bundles due to the radial power distribution. On the other hand, the heat transfer degradation in the peripheral bundles under the condition of non-uniform upper plenum water accumulation was caused by the lower flow rates of vapor and entrained liquid above the quench front in those bundles by the reason that vapor concentrated in the center bundles due to the cross flow induced by the horizontal pressure gradient in the core. The above-mentioned two-dimensional heat transfer behaviors calculated with the COBRA/TRAC code is similar to those observed in SCTF tests and therefore those calculations are useful to investigate the mechanism of the two-dimensional effects in SCTF reflood tests.

49570 (JAERI-M—86-199) **Effect of core cooling on remelting of TMI-2 debris bed.** Soda, Kunihisa; Yamano, Norihiro. (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703619.

Possible remelt of the TMI-2 debris bed was examined by using the simple assumptions of heat conduction in the debris bed. Physical properties, heat generation rate and surface heat flux were selected as parameters for the analysis. The following conclusions were drawn from the results. i) The center region of the TMI-2 debris bed would have remelted at 20 min after the debris bed lost its coolable geometry due to possible flow blockage by the molten core. ii) Among the physical properties, reductions of density, specific heat and depth of the debris bed would reduce the time to remelt the debris bed. iii) Due to the simple assumptions made in the present analysis, there exists some uncertainty in the time to remelt the TMI-2 debris bed since the effect of remaining coolant in the debris bed and its steam cooling effect were neglected in the analysis. iv) Uncertainty associated with the assumptions made in the present analysis would be approximately -10 min and +20 min. Further analysis will be necessary to better characterize the remelt of the TMI-2 debris bed. The following considerations will have to be made for future analysis; quench characteristics of the debris bed, coolant distribution in the debris bed, better characterization of the debris bed.

49571 (JAERI-M—87-001) **Evaluation report on CCTF core-II reflood test C2 - 8 (Run 67). Effect of system pressure.** Akimoto, Hajime; Iguchi, Tadashi; Okubo, Tsutomu; Murao, Yoshio; Okabe, Kazuharu; Sugimoto, Jun. (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. 91p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703620.

In order to study the system pressure effect of the core cooling and flow behavior during the reflood phase of a PWR LOCA, a test was performed with CCTF under the system pressure pf 0.15 MPa as a counterpart test of the CCTF test C2-1 (system pressure 0.42 MPa) and the CCTF test C2-4 (system pressure 0.20 MPa). Through the comparisons of results from these three tests, the following conclusions were obtained: (1) The higher system pressure resulted in the lower temperature rise, the shorter turnaround time and the shorter quench time as observed in the CCTF Core-I system pressure effect tests. (2) The higher system pressure resulted in higher core water head, higher upper plenum water head, higher mass flow rate through the primary loops. On the other hand, the higher system pressure resulted in lower downcomer water head and lower pressure drop through the primary loops and the broken cold leg. These system pressure effects on the flow behavior in the primary system are almost the same as observed in the system pressure effect tests in the CCTF Core-I test series. (3) Before the mixture level in the upper plenum reached the level of the hot leg nozzle, the loop flow resistance coefficient of the intact loops was nearly constant regardless of the system pressure. After the mixture level reached the level of the hot leg nozzle, the loop flow resistance coefficient was increased due to the water accumulation in the hot leg piping and the inlet plenum of the steam generator in these tests. (J.P.N.).

49572 (KFKI—1987-06/G) **Dynamic studies in the primary coolant circuits. Pt. 1. Experimental studies on the simultaneous drop-out of 6 major pumps in the PMK-NVH facility.** Ezsoel, Gy.; Baranyai, G.; Csom, V. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jan 1987. 50p. (In Hungarian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703629.

An experiment on high-pressure loop of the Central Research Institute for Physics, KFKI, Hungary, modelling the total loss of flow due to the simultaneous drop-out of the six major pumps of the Paks Nuclear Power Plant was performed. The instrumentation and data acquisition are presented in detail. Accord-

ing to the measured thermohydraulic data, the reactor transients can be studied effectively using the experimental facility. (V.N.). 3 refs.; 4 tables (43 pages).

49573 **(UFRJ-COPPE-PEN—139) TEMPERA-V2. A computer program for sensitivity analysis in a cooling channel of nuclear reactors. Vol. 1.** Andrade Lima, F.R. de; Alvim, A.C.M. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). Sep 1986. 90p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703667.

The sensitivity of linear responses associated with physical quantities governed by non linear differential systems is studied, using perturbation theory. The equivalence and formal differences of differential and GPT formalisms are shown. Both of them and also the matricial formalism are used for sensitivity calculations of transient problems in a typical PWR coolant channel. The results obtained are encouraging with respect to the potentiality of the method for thermal-hydraulic calculations normally performed for reactor design and safety analysis.

49574 **(UJV—7750-T) In-pile loop experiments in water chemistry and corrosion.** Kysela, J.; Jindrich, K.; Masarik, V.; Fric, Z.; Chotivka, V.; Hamerska, H.; Vsolak, R.; Erben, O. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Aug 1986. 77p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703668.

Methods and techniques used were as follows: (a) Method of polarizing resistance for remote monitoring of instantaneous rate of uniform corrosion. (b) Out-of-pile loop at the temperature 350 degC, pressure 19 MPa, circulation 20 kgs/h, testing time 1000 h. (c) High temperature electromagnetic filter with classical solenoid and ball matrix for high pressure filtration tests. (d) High pressure and high temperature in-pile water loop with coolant flow rate 10 000 kgs/h, neutron flux in active channel 7x10/sup 13/ n/cm/sup 2/.s, 16 MPa, 330 degC. (e) Evaluation of experimental results by chemical and radiochemical analysis of coolant, corrosion products and corrosion layer on surface. The results of measurements carried out in loop facilities can be summarized into the following conclusions: (a) In-pile and out-of-pile loops are suitable means of investigating corrosion processes and mass transport in the nuclear power plant primary circuit. (b) In studying transport phenomena in the loop, it is necessary to consider the differences in geometry of the loop and the primary circuit, mainly the ratio of irradiated and non-irradiated surfaces and volumes. (c) In the experimental facility simulating the WWER-type nuclear power plant primary circuit, solid suspended particles of a chemical composition corresponding most frequently to magnetite or nickel ferrite, though with non-stoichiometric composition Me/sub x//sup 2+/Fe/sub 3-x//sup 3+/O/sub 4/, were found. (d) Continuous filtration of water by means of an electromagnetic filter removing large particles of corrosion products leads to a decrease in radioactivity of the outer epitactic layer only. The effect of filtration on the inner topotactic layer is negligible.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 49712, 49718, 49719, 49720, 49721, 49722, 49723, 49726

49575 **(BNL—39916) Thermal-hydraulic modeling of porous bed reactors.** Araj, K.J.; Nourbakhsh, H.P. (Brookhaven National Lab., Upton, NY (USA)). 1987. Contract AC02-76CH00016. 5p. (CONF-871101—18). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011297.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

Optimum design of nuclear reactor core requires an iterative approach between the thermal-hydraulic, neutronic and operational analysis. This paper concentrates on the thermal-hydraulic behavior of a hydrogen cooled, small particle bed reactor (PBR). The PBR core, modeled here, consists of a hexagonal array of fuel elements embedded in a moderator matrix. The fuel elements are annular packed beds of fuel particles held between two porous cylindrical frits. These particles, 500 to 600 μm in diameter, have a uranium carbide core, which is coated by two layers of graphite and an outer coating of zirconium carbide. Coolant flow, radially inward, from the cold frit through the packed bed and hot frit and axially out the channel, formed by the hot frit, to a common plenum. 5 refs., 1 fig., 2 tabs.

49576 **(CEA-CONF—8866) Technical evolution and operation of French CO/sub 2/ cooled reactors (UNGG).** Berthion, Y. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Oct 1986. 10p. (CONF-8610160—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752815.

From IAEA technical committee meeting on gas-cooled reactors and their applications; Juelich, F.R. Germany (20 Oct 1986).

The technical evolution of the five French CO/sub 2/ cooled reactors (UNGG) from 1981 to 1986 needs to be outlined. These technical evolutions concerned the fuel element of Bugey 1 which is now slightly enriched, as well as the load reduction operation required by the grid. In addition work in underway to increase the safety at the two St Laurent units, or to repair the hot steel upper-structures of Chinon-3 unit.

49577 **(DOE/HTGR—87-088) The Modular High-Temperature Gas-Cooled Reactor (MHTGR) in the US.** Neylan, A.J.; Graf, D.V.; Millunzi, A.C. (GA Technologies, Inc., San Diego, CA (USA)). Aug 1987. Contract AC03-84SF11963. 15p. (CONF-870863—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000053.

From Seminar on small and medium-sized nuclear reactors: safety and licensing issues; Lausanne, Switzerland (24 Aug 1987).

The MHTGR is an advanced nuclear reactor concept being developed in the USA under a cooperative program involving the US Government, the nuclear industry, and the utilities. As its objective, this program is developing a safe, reliable, and economic nuclear power option for the USA and the other nations of the world to consider in meeting their individual nationalistic electrical generation or process heat needs by the turn of the century. The design is based on a concept of modularization that can meet the various power needs by combining any number of 350 MW(t) reactor modules in parallel with a selected number of turbine plants in a variety of arrangements. Basic HTGR features of ceramic fuel, helium coolant, and graphite are sized and configured to provide a low power density core with passive safety features such that no operator action or external source of power is needed for the plant to meet 10CFR100 or Protective Action Guidelines limits at the 425 m site boundary. This precludes the necessity to plan for the evacuation or sheltering of the public during any licensing basis event. The safe behavior of the reactor plant is not dependent upon operator action and it is insensitive to operator error. The Conceptual Design is presently being vigorously reviewed by the US Nuclear Regulatory Commission (NRC). A safety evaluation report and a licensability statement are scheduled for issuance by the NRC in January 1988. 2 refs., 5 figs., 1 tab.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 49363, 49654, 49675, 49702, 49709, 49710, 49845, 49847

49578 **(BNL-NUREG—39957) Evaluation of advanced liquid metal reactor passive air cooling systems.** Kroeger, P.G.; Van Tuyle, G.J. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). Jun 1987. Contract AC02-76CH00016. 9p. (CONF-871101—47). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012120.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This report compares performance of two different residual heat removal systems developed for liquid metal reactors. 2 refs., 2 figs., 1 tab. (JDH)

49579 **(CNIC—00012) Research of a high precision sodium pressure transducer.** Chen Daolong. (China Nuclear Information Centre, Beijing, BJ). 1986. 7p. (In Chinese). (SINRE—0002). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703383.

A high precision sodium pressure transducer using the dynamometric annulus as the Sensor is developed. The construction of the transducer, the calculation of the dynamometric annulus, the fixation of the strain gauge, the measurement circuits and the graduation calibration installation are described. The method of the on-line correction of the temperature effect is given. The calibration errors are analyzed. Comparisons indicate that this transducer posseses very good linearity and less hysteresis errors. High precision sodium pressure data can be obtained by on-line correction of the temperature effect.

49580 **(CONF-871101—11) Validation of the RVACS [Reactor Vessel Auxiliary Cooling System]/RACS [Reactor Air Cooling System] model in SASSYS-1.** Dunn, F.E. (Argonne National Lab., IL (USA)). 1987. Contract W-31109-ENG-38. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011375.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The SASSYS-1 LMR systems analysis code contains a model for transient analysis of heat removal by a RVACS (Reactor Vessel Auxiliary Cooling System) or a RACS (Reactor Air Cooling System) in an LMR (Liquid Metal Reactor). This model has been validated by comparisons of model predictions with experimental data from a large scale RVACS/RACS simulation experiment performed at Argonne National Laboratory. 4 refs., 1 fig.

49581 **(CONF-871101—14) Comparisons of power transfer functions and flow transfer functions.** Grimm, K.N.; Meneghetti, D. (Argonne National Lab., IL (USA)). 15 Nov 1987. Contract W-31109-ENG-38. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011372.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

Transfer functions may be used to calculate component feedbacks or temperature increments by convolution of the transfer function with the appropriate fractional change in system-quantity. Power-change transfer functions have been reported. The corresponding flow transfer functions for this case, and comparison with the power transfer functions, are reported here. Results of feedback simulation of ramped flow transients using flow transfer functions are also described.

49582 **(CONF-871101—15) SASSYS-1 modelling of RVACS [Reactor Vessel Auxiliary Cooling System]/RACS [Reactor Air Cooling System] heat removal in an LMR [Liquid Metal Reactor].** Dunn, F.E. (Argonne National Lab., IL (USA)). 1987. Contract W-31109-ENG-38. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011370.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The SASSYS-1 Liquid Metal Reactor (LMR) systems analysis code contains a model for transient analysis of heat removal by a RVACS (Reactor Vessel Auxiliary Cooling System) or a RACS (Reactor Air Cooling System) in an LMR (Liquid Metal Reactor). This air-side RVACS/RACS model is coupled with the sodium-side primary loop thermal hydraulics model in SASSYS-1 to give a complete treatment of the problem. Application of this model to an unprotected loss-of-flow event in the PRISM reactor shows that in the long run the RVACS cooling is sufficient to prevent unacceptably high system temperatures in this case. Part II provides a general description of the RVACS/RACS model. Part III lists some of the basic equations used in the model, and Part IV describes an application to an unprotected LOF (Loss-of-Flow) event in PRISM.

49583 **(CONF-871101—21) Integrated oxidation-glass formation process for waste sodium disposal.** Rajan, J.B.; Kumar, R.; Vissers, D.R. (Argonne National Lab., IL (USA)). 1987. Contract W-31109-ENG-38. 5p. NTIS, PC A02/MFA01; 1; GPO Dep. File Number DE87011369.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

For permanent disposal of the large quantities of mildly contaminated waste liquid metals (primarily sodium) used as coolants in nuclear reactors, and currently stored at different DOE sites, it is necessary to convert the metal to a stable and environmentally acceptable disposable form at minimum cost. Work on air oxidation of sodium done by Mine Safety and Appliances, Inc. (MSA) in 1980 showed the feasibility of converting the metal to its oxides. This study investigates the development of an integrated sodium burn-glass formation process to convert waste sodium to a disposable glass form.

49584 (IWGFPT—25, pp 23-34) **Caesium as an internal chemistry monitor of fast neutron reactor fuel pins irradiated at high burn-up.** Delbrassine, A. (Centre d'Etude de l'Energie Nucleaire, Mol, Belgium). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The oxygen potential of solid solution UO/sub 2/ and PuO/sub 2/ is thought to increase linearly with burn-up. Some measurements of chemical oxygen potential performed on simulated high burn-up fuel suggest an increasing oxygen potential. A wrong manipulation during the P.I.E. of a fuel pin irradiated in the reactor Rapsodie at high burn-up (10 at.%) revealed the presence of free metallic caesium in the fuel pin plenum. Accurate determinations of the caesium location in sister pins allow to observe that the caesium present at the fuel column level is completely bound and partially free at the lower blanket level. Doped fuel pins with caesium alone revealed that metallic caesium was present in the plenum and did not locally react with the clad material or the fuel column. It led to the conclusion that the local chemical oxygen activity in the doped fuel pins was below the threshold value to form Cs/sub 4/CrO/sub 4/ or Cs/sub 2/UO/sub 4-x/. All these observations tend to prove that the chemical oxygen potential variation in irradiated fuel pins takes place in the opposite direction from the estimated one. This oxygen potential would be ranged between -500 kJ/mole and -620 kJ/mole at 10 at.% burn-up. 14 refs, 10 figs, 4 tabs.

49585 **(IWGFR—56) Status of national programmes on fast breeder reactors. Eighteenth annual meeting, Vienna, Austria, 16-19 April 1985.** (International Atomic Energy Agency, Vienna (Austria). International Working Group on Fast Reactors). Feb 1986. 156p. (In several languages). (CONF-8504309—). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766.

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

The Eighteenth Annual Meeting on the Status of National Programmes in Member States of the IAEA on Fast Breeder Reactors had been held in April 1985. The representatives of the Member States and international organizations reported status and activities in the field of fast breeder reactors development and operation. A separate abstract was prepared for each of the 12 presentations of the meeting. Refs, figs and tabs.

49586 (IWGFR—56, pp 5-20) **Development of fast neutron reactors in France in 1984.** Benoist, E.; Champeix, L. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette, France). Feb 1986. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

The paper presents the main activities in the field of fast neutron reactors in France in 1984, namely the operations for the decommissioning of the RAPSODIE reactor, the operation of the PHENIX reactor including two incidents, the start of the thermic tests at the SUPERPHENIX 1 reactor, the studies for the Project 1500 (SUPERPHENIX 2) at NOVATOME and the research programs in the field.

49587 (IWGFR—56, pp 21-41) **Status of fast breeder reactor development in the Federal Republic of Germany, Belgium and the Netherlands - February 1985.** Hueper, R. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Projekt Schneller Brueter). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

In 1967 and 1968, the Federal Republic of Germany, the Kingdom of Belgium and the Kingdom of the Netherlands ("DeBeNe") agreed to develop breeder reactors in a joint program. The following research organizations have taken part in this effort: Kernforschungszentrum Karlsruhe (KfK); INTERATOM, Bergisch Gladbach; ALKEM, Wolfgang near Hanau; SCK/CEN, Mol; Belgonucleaire, Brussels; ECN, Petten; TNO, Apeldoorn; NERATOOM, The Hague. The three Germany institutions mentioned above have been associated since 1977 in the Entwicklungsgemeinschaft (EG) Schneller Brueter. KfK, INTERATOM, and the French Commissariat a l'Energie Atomique entered into contracts in 1977 about close cooperation in the fast breeder field, to which the Belgian and Dutch partners acceded. The results of activities carried out by the DeBeNe partners in 1984 have been compiled in this report. The report begins with a survey of the fast reactor plants followed by a R and D summary. In an additional chapter, a survey is given of international cooperation in 1984. 13 figs.

49588 (IWGFR—56, pp 42-51) **Review of fast reactor activities in India (1984).** Paranjpe, S.R. (Reactor Research Centre, Kalpakkam, India). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

During the year a number of reviews and construction activities have been practically completed as required for the 1st criticality of FBTR. The reactor is expected to become critical by the middle of 1985. The design studies for 500 MWe prototype fast breeder reactor (PFBR) have been continued. Due to preoccupation with the completion of construction of FBTR, the limited effort has been focussed on the design of key components like the sodium pumps, drivers for sodium pumps, control rod drive mechanism and steam generators. The main programs, which are a continuing activity in RRC, are discussed in this report. They are: reactor physics, radio-chemistry, metallurgy, reprocessing and safety research.

49589 (IWGFR—56, pp 52-63) **Review of the Italian fast reactor programme - April 1985.** Pierantoni, F.; Tavoni, R. (ENEA, Bologna, Italy). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

On February 28th 1985 the government committee for economic planning recommended the budget for the next 1985-1989 plan of ENEA for a total amount of 5,340 billion lire. At a cabinet meeting this allocation was subsequently approved (3rd April 1985). During the same period the personnel in ENEA is expected to increase from about 5,000 people in 1985 up to 5,700 people in 1989. The largest effort is devoted to the development of the FBRs, with a total of 1,760 billion lire. This figure includes: 1,050 billion for the completion of the PEC reactor; 220 billion to be used for industrial promotion activities; this figure also covers the ENEA effort in supporting Italian industry in the design and construction of the power plant to be built in Europe after SPX-1; 250 billion will be spent on the R and D to be carried out in the ENEA centres, laboratories and facilities, mainly oriented towards verifying safety and reliability aspects of subsystems and components, including the fuel element; the balance should cover current costs and investments for services, especially in the Brasimone Centre, where the PEC reactor is under construction. As far as European cooperation is concerned, a first significant result has been achieved in the negotiation of the R and D agreement foreseen by the "Memorandum of Understanding" of March 2nd 1984. The delegations of different countries have completed an agreed text, whose signing is expected in the coming months. The Italian attitude is to aim to achieve a coherent framework of agreements between utilities, industries and research bodies so as to ensure that the construction of the power station following SPX-1 can actually be the first step towards a European " Common model" fast breeder reactor plant. In 1984 the sum assigned by ENEA for fast reactors was about 380 billion lire of which 287 billion was for the PEC reactor. 8 figs.

49590 (IWGFR—56, pp 64-80) **Review of fast reactor program in Japan - April 1985.** Matsuno, Y. (Power Reactor and Nuclear Fuel Development Corp., Higashi, Ibaraki, Japan). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

The fast breeder reactor development project in PNC has been in progress steadily in these nineteen years. Concerning the experimental fast reactor "JOY", continuous operation on the Mark-II core has been succeeded, attaining the accumulated power of 745,203 MWH (8,823.84 hours) since the first criticality of the Mark-II core on 22 November 1982. The maximum burnup of a test fuel subassembly is approximately 60,000 MWD/T. Until now no fuel failure was observed. With respect to the prototype fast breeder reactor "MONJU", the first contract on reactor component fabrication was closed in January 1984 between the PNC and component manufacturers and the activity for fabrication permit has recently started. Testings of some sodium components are being still continued to verify their expected performance for "MONJU" Plant in Oarai Engineering Centre/PNC. Conceptual design of a demonstration reactor and elementary technology development including general design studies for large LMFBR are being carried out at the Federation of Electric Power Companies (FPO) and at PNC, respectively. 6 figs.

49591 (IWGFR—56, pp 81-93) **Status of work on fast reactors in the USSR - April 1985.** Rinejskij, A.A.; Khodarev, Eh.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Feb 1986. (In Russian). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

The review of the main activities in the field of fast breeder reactors in the USSR is given in this report. The results of the FBR type reactor's operation, particularly BR-19, BOR-60, BN-350, BELOYARSK-3, is discussed in the first part of the report together with design philosophy for the reactors BN-800 and BN-1600. The results of the experimental and theoretical investigations of the physical process in the fast reactors and materials testing programmes which were held in 1984, are described in the second part. 2 tabs.

49592 (IWGFR—56, pp 94-121) **Review of the United Kingdom fast reactor programme: March 1985.** Bramman, J.I.; John, C.T.; Wheeler, R.C. (UKAEA Risley Nuclear Power Development Establishment). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

1984 was the most successful year so far in the history of the prototype fast reactor, and the one which is sustained at high

power became possible for the first time. Generation reached the highest level between 12 August and 6 November. During 1984 there were some changes within the NNC from concentration on detail design, analysis and development in support of the CDFR. Nevertheless, most of the effort continued to be deployed on the CDFR, where the major activities have been preparation of the Design Concept Safety Report, analysis and development to establish the design and safety of the key feasibility topics and exploration of alternatives, notably plant layout and secondary containment design, to reduce cost. A further quantity of mixed (U, Pu) oxide fuel was reprocessed. Most of this material consisted of fuel fabrication residues but the opportunity was also taken to carry out trial dismantling, cropping and dissolution of some non-standard sub-assemblies containing wire-wrapped pins. A special small scale development cropper was tested on the wire-wrapped pins. The dismantling and cropping of, and fuel dissolution, from these sub-assemblies containing wire-wrapped pins was successfully demonstrated. The suitability for service of a structure can usually be established by a combination of validated calculation methods and experimental studies. Analyses invariably assume that the potential distortion modes and relevant damage processes are recognized, and this may not always be possible. The validation of a structure by experiments can prove to be difficult because of the costs of testing representative samples from a structure and of applying the load and environmental conditions which the sample would experience in service. A strategy for evaluating structures, even when theoretical and experimental difficulties arise, is now evolving. 3 figs, 1 tab.

49593 (IWGFR—56, pp 122-138) **Status of fast breeder reactor development in the United States of America - April 1985.** Horton, K.E. (Department of Energy, Washington, DC, USA). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

In order to provide a continuum of development for liquid metal reactors, the U.S. program has been reshaped into two portions -- advanced converter reactor technology including the Liquid Metal Reactor for the near and intermediate term, and the Liquid Metal Fast Breeder Reactor for deployment in the twenty-first century. The focused research and development program is directed at innovative means to improve economics, provide inherent safety, and to meet the needs of the ultimate user, the utilities. Work in the fuels and materials, and reprocessing areas is being continued to support eventual deployment. A major factor in successful deployment will be the effectiveness of international collaboration in reducing costs and duplication of efforts. 2 figs, 1 tab.

49594 (IWGFR—56, pp 139-145) **Review of the activities in the field of fast reactors in CSSR - status of April 1985.** Molnar, L. (Ceskoslovenska Komise pro Atomovou Energii, Prague). Feb 1986. (In Russian). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

The CSSR is a participant of the joint COMECON countries' program on R and D work on fast reactors. It gives the CSSR unique possibilities to concentrate its effort on particular problems in the field and to keep a close contact with general problems of fast reactor development. The reviews of main activities in the field of fast reactors in the CSSR is given in this paper. These fields are: neutronics calculations of the fast reactor heterogenic core, thermohydraulics of fuel assemblies, steam generators design and materials testing. 5 figs, 2 tabs.

49595 (IWGFR—56, pp 146-150) **Review of fast reactor activities in Switzerland - April 1985.** Wydler, P. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen, Switzerland). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

In the nuclear fission field, there are activities related to many different reactor concepts, including the Light Water Reactor, the Light Water High Converter Reactor, the High Temperature Reactor, the Liquid Metal Fast Breeder Reactor and the recently proposed new concept of a small heating reactor. In 1984 the total expenditure for fast reactor activities remained the same as that in the previous year, but the budget for 1985 has declined. The 6.0 million Swiss Francs expended in 1984 have been allocated to an LMFBR safety progamme (46%) and a fuel development programme (54%). All activities reported below are carried out at the Federal Institute for Reactor Research (EIR). In the natural convection studies described in Section 5, the Nuclear Engineering Laboratory (LKT) of the Federal Institute of Technology at Zuerich is actively participating. In the past twelve months collaboration with foreign research organizations in the Federal Republic of Germany, France, Italy (JRC Ispra) and the U.K. for the LMFBR safety programme, and the Federal Republic of Germany and the U.S.A. for the fuel development programme has proved to be very fruitful. In this context an attachment agreement with CEA-DERS at Cadarache is worth mentioning, since it enabled an EIR staff member to participate in the prediction and analysis of the SCARABEE-APL in-pile tests. 2 figs, 1 tab.

49596 (IWGFR—56, pp 151-152) **Role of the Nuclear Energy Agency in the area of fast reactors.** Fujita, A. (Nuclear Energy Agency, 75 - Paris, France). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

49597 (IWGFR—56, pp 153-156) **Commission of the European Communities review of fast reactor activities - April 1985.** Balz, W. (Commission of the European Communities, Brussels, Belgium). Feb 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703766. (CONF-8504309—).

From 18. annual meeting of IWGFR on the status of national programmes on fast breeder reactors; Vienna, Austria (16 Apr 1985).

The frame in which the activities of the Commission of the European Communities are executed was described at earlier meetings. Therefore this presentation is limited to a review of some achievements made during the last year.

49598 **(IWGFR—60) Status of national programmes on fast breeder reactors. Nineteenth annual meeting, Kalpakkam, India, 11-14 March 1986.** (International Atomic Energy Agency, Vienna (Austria). International Working Group on Fast Reactors). Jun 1986. 151p. (CONF-8603208—). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767.

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

The Nineteenth Annual Meeting on the Status of National Programmes in Member States of the IAEA on Fast Breeder Reactors had been held in March 1986. The representatives of the Member States and international organizations reported status and activities in the field of fast breeder reactors development and operation. A report on uranium supply and demand was also presented by the NEA/OECD. A separate abstract was prepared for each of the 11 presentations of the meeting. Refs, figs and tabs.

49599 (IWGFR—60, pp 5-22) **Development of fast neutron reactors in France in 1985.** Benoist, E.; Champeix, L. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette, France). Jun 1986. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

The paper presents the main activities in the field of fast neutron reactors in France in 1985, namely the decommissioning of the RAPSODIE reactor, the operation of the PHENIX reactor including some incidents, the thermic and neutronic tests at the SU-

PERPHENIX 1 reactor, the studies for the Project 1500 (SUPERPHENIX 2) at NOVATOME and the research programs in the field.

49600 (IWGFR—60, pp 23-49) **Status of fast breeder reactor development in the Federal Republic of Germany, Belgium and the Netherlands - January 1986.** Hueper, R. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Projekt Schneller Brueter). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

In 1967 and 1968, the Federal Republic of Germany, the Kingdom of Belgium and the Kingdom of the Netherlands (DeBeNe) agreed to develop breeder reactors in a joint program. The French Commissariat a l'Energie Atomique entered into contracts in 1977 about dose cooperation in the fast breeder field. The results of activities carried out by DeBeNe partners in 1985 have been compiled in this report. The report begins with a survey of the fast reactor plants followed by the R and D summary. In an additional chapter, a survey is given of international cooperation in 1985. 9 figs.

49601 (IWGFR—60, pp 50-57) **Annual report to the International Working Group on Fast Reactors - 1985.** Paranjpe, S.R. (Indira Gandhi Centre for Atomic Research, Kalpakkam, India). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

Coming to the nuclear energy scenario, many landmarks have been reached during the year. The first one was the commissioning of indigenously designed and built reactor "Dhruva" which is a 100 MW/th experimental reactor at the Bhabha Atomic Research Centre. The second event was the commissioning of Madras Atomic Power Station II, power reactor of 235 MWe capacity at Kalpakkam. Madras Atomic Power Station II is a heavy water moderated - heavy water cooled natural uranium fuelled reactor of "Candu" category. The reactor has been built fully indigenously and is about to be declared to have commenced commercial operations. The third important event was the first criticality of Fast Breeder Test Reactor, reached on 18th October 1985. These events generated a great deal of enthusiasm amongst the community of nuclear scientists and engineers and the country is now looking forward with greater confidence to the larger share of nuclear energy in the energy scenario. Operational record of nuclear power stations has remained satisfactory. But some signs of anti-nuclear lobbies becoming active in some parts of the country have appeared. But broadly speaking, there is a growing awareness that India needs substantial contributions from nuclear reactors. On the economic front, G.N.P. in real terms has increased by about 4.5 percent while the inflation has been less than 8%. The trade deficit has however tended to increase with imports growing more rapidly than exports. The growth of the power sector, therefore, is likely to be constrained by the availability of resources.

49602 (IWGFR—60, pp 57-66) **Review of the Italian fast reactor programme.** Pierantoni, F.; Tavoni, R. (ENEA, Bologna, Italy). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

The Caorso power station (860 MWe) underwent its third reloading at the end of 1985. The construction work on the power station at Montalto di Castro, a twin 1,000 MWe BWR reactor plant has continued according to plan. ENEL has agreed with Ansaldo the contract for the NSSS of the Trino Vercellese nuclear plant. This will be the first of the so-called "Unified Design Nuclear Power Station", twin PWR units, Westinghouse type, 950 MWe each, with 3 cooling loops. The value of the NSSS order is 1400 billion lire, while the complete cost will be 5000 billion lire. Civil engineering work will begin in July 1987 and completion is planned for 1995. In the fast reactor field, the Italian effort has been operating in the framework of the European R and D agreement; during 1985 the sum assigned by ENEA to fast reactors, excluding PEC realization, was about 100 billion lire. Worthy of note was the signing of a formal agreement between ENEA and ENEL with the aim of coordinating their activities on fast reactor development. 3 figs, 3 tabs.

49603 (IWGFR—60, pp 66-86) **Review of fast reactor program in Japan.** Matsuno, Y. (Power Reactor and Nuclear Fuel Development Corp., Higashi, Ibaraki, Japan). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

This report covers the activities of the experimental fast reactor JOYO from April 1985 to March 1986. After completion of the 7th duty cycle operation at the end of March 1985, special operation was carried out for the in-vessel performance test of the failed fuel detection and location system by irradiating slitted pins, natural circulation test from 30 MWt, and in-core measurement of coolant flow rate of each core subassembly during April 1985. 10 figs, 2 tabs.

49604 (IWGFR—60, pp 87-101) **Current status of work on fast reactors in the Union of Soviet Socialist Republics.** Rineysky, A.A.; Troyanov, M.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

In the paper the status of work on fast reactors in the USSR as for the end of 1985 is presented. The problems of nuclear power development in the USSR, the design of BN-800 nuclear power plant, operating experience of the BN-600 nuclear power plant and of the BOR-60 experimental reactor, investigations at the BR-10 reactor, co-operation of socialist countries in the fast reactor area are considered. 6 figs, 2 tabs.

49605 (IWGFR—60, pp 102-126) **Review of the United Kingdom fast reactor programme - March 1986.** Bramman, J.I.; John, C.T.; Wheeler, R.C. (UKAEA Risley Nuclear Power Development Establishment). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

The UK programme in the field of fast reactors has continued successfully towards the following main objectives, details of which are contained in subsequent sections of this report: (2) progress with the prototype fast reactor (PFR) which achieved its design power on 4 March 1985; (3) nuclear fuel reprocessing; (4) commercial design studies; (5) structural integrity of LMFBR during its lifetime; (6) R and D work on components of LMFBR; (7) materials study; (8) sodium chemistry; (9) reactor core and fuel design philosophy; (10) safety problems; (11) plant performance studies. 1 fig, 1 tab.

49606 (IWGFR—60, pp 126-141) **Status of fast breeder reactor development in the United States of America - March 1986.** Horton, K.E. (Department of Energy, Washington, DC, USA). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

In a continuing situation of minimal electrical energy construction requirements to the turn of the decade, the U.S. LMR program has been modified to a modest level of technology development. Program focus is on innovative means to improve economics, provide inherent safety and environmental advantages and to stimulate involvement of utilities in ultimate demonstration ventures. The restructured technology program of reactor systems, core systems and fuels and materials continues at levels appropriate to provide the nucleus, and along with international collaboration, preserves the technology for utilization early in the next decade and beyond. Figs.

49607 (IWGFR—60, pp 141-146) **Review of fast reactor activities in Switzerland - March 1986.** Wydler, P. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen, Switzerland). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

During 1985 the different research activities at EIR were funded at similar levels to the previous year. Of the total Government funded R and D budget of 48 million Swiss Francs, 4.4 million (or 9%) have been expended for LMFBR related activities. These comprise an LMFBR safety programme and an advanced fuel development programme with respective expenditures of 1.9 and 2.5 million Francs. In the budget for 1986, 2.8 million Francs are allocated to the safety and 3.5 million Francs to the fuel development programme. 4 figs, 1 tab.

49608 (IWGFR—60, pp 146-149) **Commission of the European Communities review of fast reactor activities - March 1986.** Balz, W. (Commission of the European Communities, Brussels, Belgium). Jun 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87703767. (CONF-8603208—).

From 19. annual meeting of IWGFR; Kalpakkam, India (11 Mar 1986).

As had been said at earlier meetings, the fast reactor activities of the Commission of the European Communities (CEC) fall into two categories, i.e. coordination and harmonisation and R and D activities. The main achievements made during the last year are briefly outlined.

49609 (WAPD-TM—1315) **Loading assurance methods used in the manufacture of the Light Water Breeder Reactor (LWBR): (LWBR Development Program).** Beaudoin, B.R. (Bettis Atomic Power Lab., West Mifflin, PA (USA)). Sep 1987. Contract AC11-76PN00014. 79p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000440.

During the fabrication of the LWBR core, manufacturing and inspection procedures were developed and implemented to provide assurance that individual modules were manufactured according to the loading specifications. The loading assurance methods employed were a combination of administrative procedures and checks, product inspections and computer verifications. This report describes the loading assurance methods implemented during the four stages of manufacturing - urania and thoria powder processing, fuel pellet fabrication, fuel rod assembly and module assembly.

49610 **Design of a primary pump for a pool-type, liquid-metal reactor.** Dunn, C.; Gabler, M.J. (Atomics International, Rocketdyne Div., Rockwell International, Canoga Park, CA). pp 205-210 of Proceedings of the 1986 joint ASME/ANS nuclear power conference. La Grange Park, IL; American Nuclear Society (1986). (CONF-860724—).

From ASME/ANS bi-annual nuclear power conference: safe and reliable nuclear power plants; Philadelphia, PA, USA (20 Jul 1986).

The primary sodium pump for the liquid-metal reactor (LMR) has been extensively developed for the loop-type plant design. Plant designers are now concentrating on the pool-type reactor. This paper compares the functional requirements for the primary pump in the pool- and loop-type reactors. The differences have led to modifications in the hydrodynamic design of the inducer pump. A shrouded inducer is employed to allow the wide operating range required in a pool-type plant. Experimental results with the shrouded inducer are described, including the suction and head performance and life test results.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 49545, 49715

49611 (IAEA-TECDOC—420, pp 167-184) **Regulation of uranium refineries and conversion facilities in Canada.** Didyk, J.P. (Atomic Energy Control Board, Ottawa, Ontario, Canada. Directorate of Fuel Cycle and Materials Regulation). May 1987. NTIS (US Sales Only), PC A13/MF A01. File Number DE88700116. (CONF-8604358—).

From Technical committee meeting on advances in uranium refining and conversion; Vienna, Austria (7 Apr 1986).

The nuclear regulatory process as it applies to uranium refineries and conversion facilities in Canada is reviewed. In the early 1980s, Eldorado Resources Limited proposed to construct and operate new facilities for refining yellowcake and for the production of uranium hexafluoride (UF/sub 6/). These projects were subject to regulation by the Atomic Energy Control Board. A description of the Atomic Energy Control Board's comprehensive licensing process covering all stages of siting, construction, operation and eventual decommissioning of nuclear facilities is traced as it was applied to the Eldorado projects. The Atomic Energy Control Board's concern with occupational health and safety, with public health and safety and with protection of the environment so far as it affects public health and safety is emphasized. Some regulatory difficulties encountered during the project's development which led to opening up of the licensing process to public input and closer coordination of regulatory activities with other provincial and federal regulatory agencies are described. The Board's regulatory operational compliance program for U refineries and conversion facilities is summarized. 10 refs, 5 figs.

49612 **(KFKI—1987-04/G) Critical evaluation of nuclear safety reports. Pt. 1. Procedures applied in the USA and the FRG.** Egely, Gy. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jan 1987. 59p. (In Hungarian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703628.

Licensing procedures of siting, commissioning and operation of nuclear power plants in the USA, FRG, France and Japan are compared. The standard format and content of nuclear safety analysis reports including the general description of the plant, the presentation of the characteristics of siting, building structures, components, facilities, the reactors, the cooling system, the safety system, the measuring and control system, the power supply system, the auxilliary system, the energy transformation system, etc. are discussed in detail by the example of the US procedure. (V.N.).

49613 **(NUREG—0750-Vol.25-Index.1) Indexes to Nuclear Regulatory Commission issuances, January-March 1987.** (Nuclear Regulatory Commission, Washington, DC (USA)). Sep 1987. 40p. NTIS, PC A03 - GPO. File Number TI88900024.

Digests and indexes for issuances of the Commission, the Atomic Safety and Licensing Appeal Panel, the Atomic Safety and Licensing Board Panel, the Administrative Law Judge, the Directors' Decisions, and the Denials of Petitions of Rulemaking are presented in this document.

49614 **(NUREG—1194) Construction appraisal team inspection results on welding and nondestructive examination activities.** Wu, P.C.S.; Shaaban, H.I. (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Reactor Inspection and Safeguards). Sep 1987. 54p. NTIS, PC A04/MF A01 - GPO. File Number DE88900003.

This report summarizes data and findings on deficiencies and discrepancies in welding and nondestructive examination (NDE) activities identified by the US Nuclear Regulatory Commission Construction Appraisal Team (CAT) during its inspection of 11 plants. The CAT reviewed selected welds and NDE packages in its inspection of the following plant areas: piping and pipe supports and/or restraints; modification and installation of reactor internals; electrical installations and electrical supports; instrumentation tubing and supports; heating, ventilation, and air conditioning (HVAC) systems and supports; fabrication and erection of structur-

al steel; fabrication of refueling cavity and spent fuel pool liner; containment liner and containment penetrations; and fire protection systems. The CAT inspected both structural welds and pressure-retaining welds and reviewed welder qualification test records and welding procedure documents for code compliance. The NDE activities that were evaluated included visual examination, magnetic particle examination, liquid penetrant examination, ultrasonic examination, and radiographic examination of welds. 4 refs., 14 figs., 15 tabs.

49615 (NUREG—1278) Vogtle Unit 1 readiness review: Assessment of Georgia Power Company readiness review pilot program. Lewis, G. (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Licensee Performance and Quality Evaluation). Sep 1987. 28p. NTIS, PC A03/MF A01 - GPO. File Number DE88900004.

Georgia Power Company (GPC) performed a readiness review at Vogtle Unit 1 as a pilot program. The pilot program was a new and innovative approach for the systematic and disciplined review, with senior management involvement, of GPC's implementation of design, construction, and operational readiness processes. The program's principal objective was to increase the level of assurance that quality programs at Vogtle Unit 1 have been accomplished in accordance with regulatory requirements. This report assesses the effectiveness of the GPC's readiness review pilot program (RRPP) at Vogtle Unit 1. It includes (1) an overview of what was experienced during the program's implementation, (2) an assessment of how well program objectives were met, and (3) lessons learned on the future use of the readiness review concept. Overall, GPC and the NRC staff believe that the RRPP at Vogtle Unit 1 was a success and that the program provided significant added assurance that Vogtle Unit 1 licensing commitments and NRC regulations have been adequately implemented. Although altering the NRC licensing review process for the few plants still in the construction pipeline may not be appropriate, licensees may benefit significantly by performing readiness reviews on their own initiative as GPC did for Vogtle. (7 refs.)

2108 Economics

49616 (INIS-BR—831) Economy of total shielding consumption of the reactor building obtained by large models of finite elements. Thomaz, E.C.S.; Carvalho, L.J. de; Vaz, L.E.; Vellasco Filho, A.A. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 10p. (In Portuguese). (CONF-8605239—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703727.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

The procedures adopted in the reactor building structural project to estimate the steel consumption for constructing are presented. (M.C.K.).

22 NUCLEAR REACTOR TECHNOLOGY

49617 World nuclear directory. A guide to organizations and research activities in atomic energy. 7th edition. Wilson, C.W.J. Harlow, Essex England; Longman Group Ltd. (1985). 450p. Longman Group Ltd., Westgate House, The High, Harlow, Essex England CM10 1NE.

This book is an international guide to over 1500 organizations and laboratories which conduct or promote research, development or substantial manufacturing work in the atomic energy field. Subjects covered range from high energy nuclear physics, plasma physics and fusion technology, to radioactive waste management, economics and regulatory developments. Improvements in format have been made and the directory is indexed by title and by subject.

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 49655, 49687, 49688, 49689, 50129

49618 (CONF-871101—23) Benchmarking of the 99-group ANSL-V library. Wright, R.Q.; Ford, W.E. III; Greene, N.M.; Petrie, L.M.; Primm, R.T. III; Westfall, R.M. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011645.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The purpose of this paper is to present thermal benchmark data testing results for the BAPL-1, TRX-1, and SEEP-1 lattices, using selected processed cross-sections from the ANSL-V 99-group library. 7 refs., 1 tab.

49619 (CONF-871101—26) Methodology for global nonlinear analysis of nuclear systems. Cacuci, D.G.; Cacuci, G.L. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA). Dept. of Nuclear Engineering). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011666.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This paper outlines a general method for globally computing the crucial features of nonlinear problems: bifurcations, limit points, saddle points, extrema (maxima and minima); our method also yields the local sensitivities (i.e., first order derivatives) of the system's state variables (e.g., fluxes, power, temperatures, flows) at any point in the system's phase space. We also present an application of this method to the nonlinear BWR model discussed in Refs. 8 and 11. The most significant novel feature of our method is the recasting of a general mathematical problem comprising three aspects: (1) nonlinear constrained optimization, (2) sensitivity analysis, into a fixed point problem of the form $F[u(s), \lambda(s)] = 0$ whose global zeros and singular points are related to the special features (i.e., extrema, bifurcations, etc.) of the original problem.

49620 (INIS-BR—735) Numerical solution of the neutron spatial flux evolution. Rosa, M.A.P.; Alcantara, H.G. de; Prati, A.; Nair, R.P.K. (Sociedade Brasileira de Matematica Aplicada e Computacional, Rio de Janeiro). 1984. 6p. (In Portuguese). (CONF-8409402—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703487.

From 7. national congress on applied and computational mathematics; Campinas, SP, Brazil (24 Sep 1984).

A computer program for numerical solution of the time dependent one dimensional multigroup neutron diffusion equation is described. The space dependence is treated by finite difference method. The time integration is carried out by weighed residual method. Some schemes of convergence acceleration are investigated. (M.C.K.).

49621 (JAERI-M—86-178, pp 2-31) Benchmark calculation of nuclear design code for HCLWR. Suzuki, Katsuo; Saji, Etsuro; Gakuhari, Kazuhiko; Akie, Hiroshi; Takano, Hideki; Ishiguro, Yukio. (Mitsubishi Atomic Power Industries, Inc., Tokyo, Japan). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

In the calculation of the lattice cell for High Conversion Light Water Reactors, big differences of nuclear design parameters appear between the results obtained by various methods and nuclear data libraries. The validity of the calculation can be verified by the critical experiment. The benchmark calculation is also efficient for the estimation of the validity in wide range of lattice parameters and burnup. As we do not have many measured data. The benchmark calculations were done by JAERI and MAPI, using SRAC and WIMS-E respectively. The problem covered the wide range of lattice parameters, i.e., from tight lattice to the current PWR lat-

tice. The comparison was made on the effective multiplication factor, conversion ratio, and reaction rate of each nuclide, including burnup and void effects. The difference of the result is largest at the tightest lattice. But even at that lattice, the difference of the effective multiplication factor is only 1.4%. The main cause of the difference is the neutron absorption rate U-238 in resonance energy region. The difference of other nuclear design parameters and their cause were also grasped.

49622 (JAERI-M—86-178, pp 115-140) **Proposal of benchmark problems for three-demensional transport codes.** Fujimura, Toichiro; Sasamoto, Nobuo; Kotegawa, Hiroshi. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

In order to evaluate various three-dimensional transport codes, we propose the following two benchmark problems which have been selected out of experiments. As the reference values, solutions by the Monte Carlo codes are given in addition to the measurements. Some characteristic parameters which were not measured are also to be calculated in the benchmark tests. 1) Calculation of eigenvalue and power distribution for the FCA assembly XII-1. In this problem, the eigenvalues and power distributions are to be calculated for various control rod patterns. Spatial and angular mesh effects are to be examined. 2) Neutron streaming in the JRR-4 shield. In this problem, the reaction rate distributions are to be calculated along the central axis of a rectangular air slot in graphite shields when fission neutrons are injected into the slot.

49623 **(KFKI—1987-22/G) DIGA/NSL new calculational model in slab geometry.** Makai, M.; Gado, J.; Kereszturi, A. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Apr 1987. 44p. (CONF-870424—15). NTIS (US Sales Only), PC A03/MF A01. File Number DE88700267.

From American Nuclear Society international meeting on advances in reactor physics, mathematics and computation; Paris, France (27 Apr 1987).

A new calculational model is presented based on a modified finite-difference algorithm, in which the coefficients are determined by means of the so-called gamma matrices. The DIGA program determines the gamma matrices and the NSL program realizes the modified finite difference model. Both programs assume slab cell geometry, DIGA assumes 2 energy groups and 3 diffusive regions. The DIGA/NSL programs serve to study the new calculational model. 8 refs.; 5 figs.; 9 tables.

2202 Components And Accessories

49624 **(BNL-NUREG—39923) PRAAGE: An interactive IBM-PC code for unreliability/aging analysis.** Fullwood, R.R.; Hall, R.E.; Taylor, J.H. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 6p. (CONF-871101—51). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012124.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The more redundant a system is, the faster its unavailability increases with aging. Normally a highly redundant system has a small unavailability contribution, but aging may make it significant. This is due to the fact that, as assumed in this study, aging degradation drives up the failure rate of all redundant trains and causes a rapid loss in the effectiveness of the redundancy in reducing the unavailability. Thus aging, if allowed to cross trains, can be a significant contributor to unavailability. This conclusion demonstrates the usefulness of PRAAGE for interactive systems analysis. 3 refs., 1 fig., 1 tab.

49625 **(BNL-NUREG—39970) Aging of electric motors in nuclear power plants.** Subudhi, M.; Taylor, J.H. (Brookhaven National Lab., Upton, NY (USA)). Jun 1987. Contract AC02-76CH00016. 7p. (CONF-871101—44). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012484.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

Motor degradation due to aging and service wear decreases reliability and increases the potential for failure during nuclear plant accident and post accident conditions. The impact of motor failures on plant safety is an important concern among the nuclear utilities and the government agency regulating this industry. Economic impacts, relating to plant availability and safety, as well as corrective maintenance, have prompted utilities to improve their maintenance programs to mitigate such aging effects. 2 refs., 3 figs.

49626 **(EPRI-NP—5380-Vol.1) Visual weld acceptance criteria: Volume 1, Visual weld acceptance criteria for structural welding at nuclear power plants (NCIG-01, Revision 2): Final report.** (Reedy Associates, Inc., Los Gatos, CA (USA); Nuclear Construction Issues Group, St. Louis, MO (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 57p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920031.

The Nuclear Construction Issues Group (NCIG) was formed to resolve common problems being experienced at nuclear power plants in the assurance of hardware quality for which common solutions likely existed. The initial activity undertaken by this group was development of visual weld acceptance criteria and inspection guidance for structural welds. This report, Volume 1, documents the results of this NCIG activity in describing the visual weld acceptance criteria for structural welding at nuclear power plants (NCIG-01, Revision 2).

49627 **(EPRI-NP—5380-Vol.2) Visual weld acceptance criteria: Volume 2, Sampling plan for visual reinspection of welds (NCIG-02, Revision 2): Final report.** (Nuclear Construction Issues Group, St. Louis, MO (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 39p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920032.

The Nuclear Construction Issues Group (NCIG) was formed to resolve common problems being experienced at nuclear power plants in the assurance of hardware quality for which common solutions likely existed. The initial activity undertaken by this group was development of visual weld acceptance criteria and inspection guidance for structural welds. This report, Volume 2, documents the results of this NCIG activity in describing the criteria for a sampling plan for visual reinspection of welds (NCIG-02, Revision 2).

49628 **(EPRI-NP—5380-Vol.3) Visual weld acceptance criteria: Volume 3, Training manual for inspectors of structural welds at nuclear power plants using the acceptance criteria of NCIG-01 (NCIG-03, Revision 1): Final report.** (Reedy Associates, Inc., Los Gatos, CA (USA); Nuclear Construction Issues Group, St. Louis, MO (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 44p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920033.

The Nuclear Construction Issues Group (NCIG) was formed to resolve common problems being experienced at nuclear power plants in the assurance of hardware quality for which common solutions likely existed. The initial activity undertaken by this group was development of visual weld acceptance criteria and inspection guidance for structural welds. This report documents the results of this NCIC - activity the discussion of a training manual for inspectors of structural welds at nuclear power plants using the acceptance criteria of NCIG-01 (NCIG-03, Revision 1).

49629 **(EPRI-NP—5410) Nondestructive evaluation of ferritic piping for erosion-corrosion: Topical report.** Walker, S.M.; Ammirato, F.V. (EPRI Nondestructive Evaluation Center, Charlotte, NC (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 192p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920025.

This report was generated to assist utilities in their inspection programs to detect wall thinning caused by erosion/corrosion in nuclear and fossil power plant piping. Included is a logical approach or "Road Map" to step utilities through an inspection program. This report provides guidance on selection of examination techniques for specific plant situations, discusses the capabilities of various nondestructive examination (NDE) techniques (both currently available as well as those under development), describes the specific essential variables associated with each NDE technique, and gives suggestions for additional detailed examinations if erosion/corrosion is detected. Ultrasonic, radiographic, and visual examination methods are discussed in detail; other NDE techniques are briefly mentioned. This report addresses NDE considerations only; selection of piping for examination, disposition of findings, and pipe repair or replacement are not within the scope of this work and are discussed briefly only to show their role in the overall inspection program. 17 refs., 66 figs., 3 tabs.

49630 **(INIS-BR—779) Qualification of expansion and joint welding procedures of tube-to-tubesheet joints for heat exchangers in nuclear power plants.** Camargo, G.A.M.; Couto, J.G.V.; Castro, L.A.S. de. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). 1986. 1p. (In Portuguese). (CONF-8610317—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703526.

From 4. Brazilian symposium on piping and pressure vessels; Salvador, BA, Brazil (28 Oct 1986).

Published in summary form only.

49631 **(INIS-BR—782) Seismic analysis of a containment vessel.** Toledo, E.M.; Jospin, R.J. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). 1986. 1p. (In Portuguese). (CONF-8610317—3-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703528.

From 4. Brazilian symposium on piping and pressure vessels; Salvador, BA, Brazil (28 Oct 1986).

Published in summary form only.

49632 **(INIS-BR—830) Considerations on safety against seismic excitations in the project of reactor auxiliary building and control building in nuclear power plants.** Santos, S.H.C.; Castro Monteiro, I. de. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 21p. (In Portuguese). (CONF-8605239—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703726.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

The seismic requests to be considered in the project of main buildings of a nuclear power plant are discussed. The models for global seismic analysis of nuclear power plant structures, as well as models for global strength distribution are presented. The models for analysing reactor auxiliary building and control building, which together with the reactor building and turbine building form the main energy generation complex in a nuclear power plant, are described. (M.C.K.).

49633 (INIS-mf—10958, pp 102-110) **Application of automated control system in maintenance.** Karas, P. (Ceske Energeticke Zavody, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The aspects are discussed of deploying automated control systems for the maintenance of nuclear power plants. The diversity and variety of the subsystem "Maintenance" is demonstrated by units of activities which are interrelated and follow one on another: concept, planning, preparation, implementation and evaluation of maintenance. It is stated on the basis of long years of experience with the use of computer technology in the maintenance of conventional power plants that it will not be possible to build all at once a fully integrated information system for maintenance control in nuclear power plants. The decision has therefore been taken for the Dukovany nuclear power plant that simple procedures will first be processed, at first separately, albeit prepared for subsequent use in projected automated control systems. The processing of these procedures was done on an ADT 4400 computer. The next step will be their conversion to the SM 52/11 M1 minicomputer where the main aim will be to simplify and automate such maintenance operations which are demanding on time and volume. The most important element in the building of the automated system of maintenance control at the Dukovany nuclear power plant will be the installation of the ES 1045 computer which should verify the designed system by the end of the year 1986. (Z.M.).

49634 (INIS-mf—10958, pp 135-139) **Use of computer technique in planning and evaluating nondestructive tests of materials and welds of selected components at the Bohunice nuclear power plants.** Ulicky, J.; Cintula, J. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia; Atomova Elektraren Bohunice, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

48 parts of the primary circuit, secondary circuit and auxiliary circuits were selected at the Jaslovske Bohunice nuclear power plant for nuclear safety monitoring. This represents a total of 13,000 checking points which have to be monitored continuously and where during overhauls nondestructive testing will have to be made with subsequent processing of reports for superior and inspection bodies. This predetermines the area for automated computer processing. The problem was solved within the project "Automated System of Nuclear Power Plant Control". Briefly discussed are some results of the solution whose correctness was proved during the two-year automated processing of nondestructive tests carried out at both units of the V-1 plant. The benefits are described of the introduction of the system into routine operation, as are trends of improvement, namely in preparation of tests and in feedback. Further improvement will mainly consist in the direct inputting of data by the user through a terminal. (Z.M.).

49635 (INIS-mf—10958, pp 271-280) **Expert systems for nuclear power plant diagnostics.** Dach, K. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Some aspects are discussed of the development and deployment of expert diagnostic systems in nuclear power in different parts of the world. A brief description is presented of the concept of the expert diagnostic system prepared for the French reactor Phenix. The example of the diagnostics of vibrations of reactor internals is used to document work in the field of the development of expert systems for nuclear power in Czechoslovakia. (Z.M.).

49636 **(LNCC—008/87) Finite element model for the stress and flexibility analysis of curved pipes.** Guerreiro, J.N.C. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). Mar 1987. 20p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703632.

We present a finite element model for the analysis of pipe bends with flanged ends or flanged tangents. Comments are made on the consideration of the internal pressure load. Flexibility and stress instensification factores obtained with the present model are compared with others available.

49637 **(LNCC—010/87) Analysis of the components of a pipeline closure as a unilateral contact problem.** Barbosa, H.J.C.; Feijoo, R.A. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). Mar 1987. 16p. (In Portuguese). (CONF-8610317—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703769.

From 4. Brazilian symposium on piping and pressure vessels; Salvador, BA, Brazil (28 Oct 1986).

In many situations in the stress analysis of piping systems and pressure vessels the need to deal with (non-linear) unilateral contact problems arises. A typical case is the analysis of the components of pipe closure. In this work, numerical algorithms developed in previous publications are apllied in an example where the system composed by the closure neck, the blanking plug and the locking ring of a pipe closure is analysed.

49638 **(NUREG/CR—4590-Vol.2) Aging of nuclear station diesel generators: Evaluation of operating and expert experience: Workshop.** Hoopingarner, K.R.; Vause, J.W. (Pacific Northwest Lab., Richland, WA (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Engineering). Aug 1987. Contract AC06-76RL01830. 63p. (PNL—5832-Vol.2; CONF-8605299—Vol.2). NTIS, PC A04/MF A01 - GPO. File Number DE87014211.

From Workshop on aging of nuclear station diesel generators: evaluation of operating and expert experience; Richland, WA, USA (28 May 1986).

Pacific Northwest Laboratory (PNL) evaluated operational and expert experience pertaining to the aging degradation of diesel generators in nuclear service. The research, sponsored by the US Nuclear Regulatory Commission (NRC), identified and characterized the contribution of aging to emergency diesel generator failures. This report, Volume II, reports the results of an industry-wide workshop held on May 28 and 29, 1986, to discuss the technical issues associated with aging of nuclear service emergency diesel generators. The technical issues discussed most extensively were: man/machine interfaces, component interfaces, thermal gradients of startup and cooldown and the need for an accurate industry database for trend analysis of the diesel generator system.

2203 Fuel Elements

REFER ALSO TO CITATION(S) 49671, 49683

49639 **(BNL-NUREG—39928) Detector response characteristics and the masking of fuel misloading errors.** Neogy, P.; Prince, A.; Carew, J.F. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 6p. (CONF-871101—46). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012122.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This paper describes how some fuel loading errors can escape detection when a reactor is being refueled. The chief factor leading to undetected errors is attributed to limited in-core instrumentation. 2 refs., 2 figs. (JDH)

49640 **(CNIC—00011) Temperature measurements of the aluminium claddings of fuel elements in nuclear reactor.** Chen Daolong. (China Nuclear Information Centre, Beijing, BJ). 1986. 13p. (In Chinese). (SINRE—0001). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703382.

A method for embedding the sheathed thermocouples in the aluminium claddings of some fuel elements of experimental reactors by ultrasonic welding technique is described. The measurement results of the cladding temperature of fuel elements in reactors are given. By means of this method, the joint between the sheathed thermocouples and the cladding of fuel elements can be made very tight, there are no bulges on the cladding surfaces, and the sheathed thermocouples are embedded strongly and reliably. Therefore an essential means is provided for acquiring the stable and dynamic state data of the cladding temperature of in-core fuel elements.

49641 **(IWGFPT—25) Fuel rod internal chemistry and fission products behaviour. Proceedings of a technical committee meeting held in Karlsruhe, 11-15 November 1985.** (International Atomic Energy Agency, Vienna (Austria). International Working Group on Water Reactor Fuel Performance and Technology). Oct 1986. 180p. (CONF-8511144—). NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057.

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The present meeting was scheduled by the International Atomic Energy Agency upon the proposal of the members of the International Working Group on Water Reactor Fuel Performance and Technology. Forty-six participants representing fourteen countries and two international organizations attended the meeting. Twenty-one presentations were discussed in four sessions: thermodynamics of fission products (six papers); fission products migration and release (seven papers); fission product release in transients or accident conditions (four papers); fission products to cladding interaction - stress corrosion cracking (five papers). A separate abstract was prepared for all twenty-one papers. Refs, figs and tabs.

49642 (IWGFPT—25, pp 16) **Chemical state of the fission products in oxide fuels.** Kleykamp, H. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Material- und Festkoerperforschung). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

A review is given on the chemical behaviour of the fission products in steady-state operated nuclear oxide fuels. The evaluation of irradiation experiments results in the description of the release, the transport properties and the alloying and reaction behaviour of fission products in their different chemical states. Out-of-pile results are presented on the solubility of some fission product oxides in UO/sub 2/ and (U, Pu)O/sub 2/ and on the phase behaviour of selected multi-component fission product systems. The consequences for the melting point, the thermal conductivity and the shift of the O/M-ratio of irradiated oxide fuels are outlined. The paper is complemented by a synopsis of the methods of the elemental analysis on irradiated materials in a micrometer scale.

49643 (IWGFPT—25, pp 63) **OECD/NEA review on fission gas release studies in the Halden project.** Kolstad, E. (Institutt for Energiteknikk, Halden, Norway). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The presentation described current experimental techniques used in in-pile investigations on fission product release (FPR) at the OECD Halden Reactor Project. A review was given of recent FPR data as influenced by fuel rod design variables; gap width, grain size, fuel density, hollow versus solid pellet etc. and operating conditions; steady state, ramp operation, load-follow, power cycling and brief power excursions. A summary of observations was given at the end of the presentation.

49644 (IWGFPT—25, pp 64-73) **How local measurements increase our understanding of fission product release.** Mogensen, M.; Walker, C.T. (Risoe National Lab., Roskilde, Denmark; Commission of the European Communities, Karlsruhe, Germany, F.R. European Inst. for Transuranium Elements). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

Results from several electron microprobe investigations of transient tested fuel are reviewed. Following a description of the radial and axial distributions of xenon in dished pellets, diffusion data derived from microprobe measurements in single grains of

UO/sub 2/ are reported. At intermediate radial positions, the xenon and caesium profiles within the grains usually conform to a parabola. The effective diffusion coefficients for xenon and caesium varied between 10/sup -15/cm/sup 2/s/sup -1/ and 10/sup -12/cm/sup 2/s/sup -1/ depending on the radial position of the grain. Data from X-ray fluorescence analysis are also presented. This technique is being used in conjunction with microprobe analysis to obtain information about gas retention at grain boundaries. First results indicate that in transient tested fuel not all the grain boundary bubbles are vented at intermediate radial positions. Evidence for the accumulation of gas at boundaries in the outer region of the fuel between r/r/sub o/=0.6 and 0.75 was not found. Finally, the behaviour of caesium and xenon under transient conditions is compared. The radial and axial distributions of these two fission products were in most cases similar even though clear differences in diffusion rates were observed. 15 refs, 11 figs, 1 tab.

49645 (IWGFPT—25, pp 73-82) **Experimental investigation of the distribution of the gaseous fission products in fuel rods.** Demildt, A.C.; Ketels, J.; Sannen, L.; Velde, J. van de. (Centre d'Etude de l'Energie Nucleaire, Mol, Belgium). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

At the laboratories of High and Medium Activity (LHMA) of the Nuclear Research Centre at Mol, several destructive techniques are existing to determine the distribution of the fission gases krypton, xenon and tritium between the cladding, the plenum and the fuel of nuclear rods. A puncture device allows to measure quantitatively the free gas contents of the plenum. Aliquots of this gas are sampled for analysis. The gas components as well as the isotopic composition of the noble gases are determined by mass spectrometry. The tritium content is found by oxidation of an aliquot to tritiated water followed by liquid scintillation counting. A hot vacuum extraction method is used to extract quantitatively the tritium out of the cladding material. The quantity of /sup 3/H gas is also measured by liquid scintillation counting after oxidation. A dissolution technique is used to determine both the tritium and noble gases contents of the fuel. Dissolution of the fuel in a boiling mixture of HNO/sub 3/-HF converts all /sup 3/H into tritiated water. This water is separated and purified by several successive distillations so that it can be measured for its /sup 3/H content by liquid scintillation counting. The same dissolution process also results in a release of the entrapped Xe and Kr molecules. After passage through a purification chain they are sampled and analysed for their isotopic composition by mass spectrometry. 3 refs, 7 figs.

49646 (IWGFPT—25, pp 121-130) **Cs and I source terms of irradiated UO/sub 2/.** Peehs, M.; Kaspar, G.; Sontheimer, F. (Kraftwerk Union A.G., Erlangen, Germany, F.R.). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The release of fission cesium and iodine from UO/sub 2/ with a burnup of ≦ 47 GWd/tU was determined experimentally in the temperature range between 900 deg. C and 1800 deg. C. The release occurs always in 2 characteristic steps: a burst release (t < or approx. 1 min) and a mainly diffusion controlled release (t > or approx. 1 min). The burst release is thermally activated and depends strongly on the surface/volume ratio and burnup. The second release step is also from Arrhenius type and is proportional to t/sup n/ with 0.5 ≦ n < 1. Besides diffusion processes, also restructuring of fuel in the high temperature range influences this release phase. Increasing O/U ratio of the UO/sub 2/ increases the Cs and I release. An assessment of the noble gas release and I/Cs release reveals a lot of simularities indicating identical release mechanisms. But there are differences in the activation energies. These will be discussed. 13 refs, 14 figs.

49647 (IWGFPT—25, pp 131-146) **Grain boundary sweeping and dissolution effects on fission product behaviour under severe fuel damage accident conditions.** Rest, J. (Argonne National Lab., IL, USA). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The theoretical FASTGRASS-VFP model has been used in the interpretation of fission gas, iodine, tellurium, and cesium release from severe-fuel-damage (SFD) tests performed in the PBF reactor in Idaho. A theory of grain boundary sweeping of gas bubbles, gas bubble behavior during fuel liquefaction (destruction of grain boundaries due to formation of a U-rich melt phase), and during U-Zr eutectic melting has been included within the FASTGRASS-VFP formalism. The grain-boundary-sweeping theory considers the interaction between the moving grain boundary and two distinct size classes of bubbles, those on grain faces and on grain edges. The theory of the effects of fuel liquefaction and U-Zr eutectic melting on fission product behaviour considers the migration and coalescence of fission gas bubbles in either molten uranium, or a Zircaloy-Uranium eutectic melt. Results of the analyses demonstrate that intragranular fission product behavior during the tests can be interpreted in terms of a grain-growth/grain-boundary-sweeping mechanism that enhances the flow of fission products from within the grains to the grain boundaries. Whereas fuel liquefaction leads to an enhanced release of fission products in trace-irradiated fuel, the occurrence of fuel liquefaction in normally-irradiated fuel can degrade fission product release. This phenomenon is due in part to reduced gas-bubble mobilities in a viscous medium as compared to vapor transport, and in part to a degradation of grain growth rates and the subsequent decrease in grain-boundary sweeping of intragranular fission products into the liquified lamina. The analysis shows that total UO/sub 2/ dissolution due to eutectic melting leads to increased release for both trace-irradiated and normally-irradiated fuel. 22 refs, 17 figs, 1 tab.

49648 (IWGFPT—25, pp 147-152) **Fission product release measured during fuel damage tests at the power burst facility.** Osetek, D.J.; Hartwell, J.K.; Vinjamuri, K.; Cronenberg, A.W. (Idaho National Engineering Lab., Idaho Falls, USA; Engineering Science and Analysis, Idaho Falls, ID, USA). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

Results are presented of fission product release behavior observed during four severe fuel damage tests on bundles of UO/sub 2/ fuel rods. Transient temperatures up to fuel melting were obtained in the tests that included both rapid quench and slow cooldown, low and high (36 GWd/t) burnup fuel and the addition of Ag-In-Cd control rods. Release fractions of major fission product species and release rates of noble gas species are reported. Significant differences in release behavior are discussed between heatup and cooldown periods, low and high burnup fuel and long-band short-lived fission products. Explanations are offered for the probable reasons for the observed differences and recommendations for further studies are given. 4 refs, 4 figs, 3 tabs.

49649 (IWGFPT—25, pp 153) **Determination of chemical conditions under which CsI can cause SCC failure of Zircaloy tubing.** Hofmann, P.; Spino, J. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Material- und Festkoerperforschung; Comision Nacional de Energia Atomica, Buenos Aires, Argentina. Dept. de Combustibles Nucleares). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

To determine whether CsI can be dissociated by the action of an oxygen potential and, therefore, can cause low-ductility failure of Zircaloy cladding due to stress corrosion cracking (SCC), out-of-pile creep rupture and burst tests were performed. The

oxygen potential in the tube specimens was established by various metal/metal oxide systems or O/U ratios of the UO/sub 2+x/. The test parameters were selected in such a manner that bust temperatures of about 700 deg. C were obtained. The results of the isothermal creep rupture tests with UO/sub 2+x/ of various O/U ratios showed that at initial oxygen potentials as high as -230 kJ/mol O/sub 2/ (which corresponds to an O/U ratio of about 2.04 at 700 deg. C), the CsI dissociates sufficiently to cause iodine-induced low-ductility cladding failure. When the oxygen potential was set by Mo/MoO/sub 2/ mixtures, sufficient dissociation of CsI took place at much lower oxygen potentials of about -400kJ/mol O/sub 2/. With respect to the CsI dissociation both the formation of Cs oxides and the possible formation of complex compounds such as Cs uranate and Cs molybdate must be considered. Under these conditions, the I from the CsI behaved like elemental iodine. That is, iodine-induced low-ductility failure of the Zircaloy-4 tubing due to SCC occurred when the fission-product element iodine was present as either elemental I or as CsI.

49650 (IWGFPT—25, pp 154-156) **Chemical thermodynamic analysis of halogen stress corrosion cracking of Zircaloy cladding.** Kohli, R. (Battelle Columbus Div., OH, USA. Nuclear Technology Section). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

The nature and morphology of the crack patterns observed in extensive iodine and, to a lesser extent, bromine laboratory stress corrosion cracking (SCC) tests of Zircaloy is uniquely similar to that observed in reactor-induced pellet-cladding-interaction (PCI) failure of Zircaloy cladding. Using experimental evidence from microprobe analyses of high burnup fuel rods and high temperature thermodynamic data, presented in a companion paper at this meeting, the chemical state of the fuel-cladding gap and, in turn, the chemistry of halogen SCC of Zircaloy cladding has been reanalyzed. The analysis shows the formation of cesium and rubidium zirconate in the fuel-cladding gap will generate sufficiently large halogen pressures to cause failure of the cladding by SCC. This is a significant conclusion since it now provides a thermodynamically feasible argument for PCI failure of the Zircaloy cladding by halogen SCC. 23 refs.

49651 (IWGFPT—25, pp 173-178) **Methods and results of out-of-pile studies of high temperature interaction between uranium dioxide fuel and zirconium alloy clads.** Golovnin, I.S.; Bibilashvili, Yu.K.; Tonkov, V.Yu.; Kulikova, K.V.; Kuznetsova, V.G.; Buchilin, V.A. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow, USSR). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

This paper discusses the methods and some results of an experimental study of chemical interaction between UO/sub 2/ 2% enriched in U-235 and zirconium-1% niobium alloy. Besides, a technique is given to study PCI using thermite mixtures. In this work PCI was studied in the temperature range 1173-1773K at the holding time of 5 minutes to 10 hours. The analysis of the results showed that it is possible to use thermite mixtures to study the chemical interaction between uranium dioxide and a clad material under the conditions of prompt heating to high temperatures. Based on the models described fuel simulators have been established, the results of the tests of which are employed to refine the computer programmes that predict the behaviour of power reactor fuels in accidents. 10 refs, 4 figs, 3 tabs.

2204 Control Systems

49652 **(CONF-870832—5) Promises in intelligent plant control systems.** Otaduy, P.J. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02. File Number DE87014780.

From Topical meeting on artificial intelligence and other innovative computer applications in the nuclear industry; Snowbird, UT, USA (31 Aug 1987).

The control system is the brain of a power plant. The traditional goal of control systems has been productivity. However, in nuclear power plants the potential for disaster requires safety to be the dominant concern, and the worldwide political climate demands trustworthiness for nuclear power plants. To keep nuclear generation as a viable option for power in the future, trust is the essential critical goal which encompasses all others. In most of today's nuclear plants the control system is a hybrid of analog, digital, and human components that focuses on productivity and operates under the protective umbrella of an independent engineered safety system. Operation of the plant is complex, and frequent challenges to the safety system occur which impact on their trustworthiness. Advances in nuclear reactor design, computer sciences, and control theory, and in related technological areas such as electronics and communications as well as in data storage, retrieval, display, and analysis have opened a promise for control systems with more acceptable human brain-like capabilities to pursue the required goals. This paper elaborates on the promise of futuristic nuclear power plants with intelligent control systems and addresses design requirements and implementation approaches.

49653 **(CONF-871013—5) A real-time BWR [boiling water reactor] stability measurement system.** March-Leuba, J.; King, W.T. (Oak Ridge National Lab., TN (USA); Computational Systems, Inc., Knoxville, TN (USA)). 1987. Contract AC05-84OR21400. 11p. NTIS, PC A02. File Number DE87013871.

From 5. SMORN: international conference on reactor noise; Munich, F.R. Germany (12 Oct 1987).

This paper describes the characteristics of a portable, real-time system used for nonperturbational measurements of stability in boiling water reactors. The algorithm used in this system estimates the closed-loop asymptotic decay ratio using only the naturally occurring neutron noise and it is based on the univariate autoregressive methodology.

49654 **(CONF-871101—10) Evidence of fast non-linear feedback in EBR-II rod-drop measurements.** Grimm, K.N.; Meneghetti, D. (Argonne National Lab., IL (USA)). Jun 1987. Contract W-31109-ENG-38. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011374.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

Feedback reactivities determine the time dependence of a reactor during and after a transient initiating event. Recent analysis of control-rod drops in the Experimental Breeder Reactor II (EBR-II) Reactor has indicated that some relatively fast feedback may exist which cannot be accounted for by the linear feedback mechanisms. The linear and deduced non-linear feedback reactivities from a control-rod drop in EBR-II run 93A using detailed temperature coefficients of reactivity in the EROS kinetics code have been reported. The transient analyses have now been examined in more detail for times close to the drop to ascertain if additional positive reactivity is being built-in early in the drop which could be gradually released later in the drop.

49655 **(CONF-871101—22) Optimal control of nonlinear nuclear reactors.** March-Leuba, C.; Perez, R.B. (Tennessee Univ., Knoxville (USA); Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011646.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This paper presents a new formulation of a class of nonlinear optimal control problems as a solution of a system of differential equations with initial conditions. An application to the control of a nonlinear nuclear reactor is shown. 3 refs., 1 fig.

49656 **(DOE/NE/37959—12) Development of an integrated signal validation system in nuclear power plants: Annual report for the period September 30, 1986-September 29, 1987.** Upadhyaya, B.R.; Kerlin, T.W.; Gloeckler, O.; Frei, Z.; Morgenstern, V.; Qualls, L. (Tennessee Univ., Knoxville (USA). Dept. of Nuclear Engineering; Combustion Engineering, Inc., Windsor, CT (USA)). Sep 1987. Contract AC02-86NE37959. 194p. NTIS, PC A09. File Number DE88000187.

In large power generating stations, signals from various instrumentation systems are channeled to control systems, protection systems, and plant monitoring systems. Validation of these signals accomplishes the following goals: minimize plant downtime, increase the reliability of operator decisions, and as an aid for scheduling plant maintenance. The signal validation methods developed under this project are designed to perform various levels of signal processing, and to detect, isolate and characterize faulty signals. A central database stores information about sensors, history of signal validation results, plant data, and subsystem models. The signal validation architecture consists of parallel signal processing modules, each of which implements a diverse validation scheme. The software development and testing of all the modules is performed using IBM PC/AT computers. All the signal validation modules are ready for preliminary implementation and are tested using operational data from a pressurized water reactor (PWR) and PWR data from the Combustion Engineering Nuclear Transient Simulation code.

49657 **(INIS-BR—789) Environmental Control Integrated System for abnormal conditions of CNAAA-Angra-1 operation.** Kircher, E.; Silva, R.A. da. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 9p. (In Portuguese). (CONF-8605239—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703533.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

A system of computer codes named NUCSICA (Calculation Nucleus of Environmental Control Integrated System) to be used in the Environmental Control Integrated System (SICA) and integrated to the supervision system of Safety Parameters (SSPS), is described. The system is based on a model compatible with local characteristics of Angra-I reactor, relating to micrometeorology, topography, population distribution and socio-economic activities. The model was constructed to foresee the environmental impact. (M.C.K.).

49658 **(INIS-mf—10958) Automated systems of nuclear power plant control. Conference proceedings.** (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice (Czechoslovakia)). 1986. 270p. (In Slovak and Czech). (CONF-8604348—). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555.

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The proceedings contain a total of 39 papers of which 35 were incorporated in INIS. They are concerned with the results of research projects and with project designs of automated systems of control for Czechoslovak nuclear power plants which are either in construction or in operation, as well as with the first experiences gained with the operation of the subsystems of automated control in Czechoslovak nuclear power plants. Attention is devoted to a broad range of problems of nuclear power plant control, not only to the problems of reactor operation but also to their maintenance, material and technical supply, technical means of automated control systems, etc. Several papers also deal with the general aspects of the theory of control systems. (Z.M.).

49659 (INIS-mf—10958, pp 97-105) **Information system for the control and production evaluation of the Mochovce nuclear power plant.** Pajtinka, V. (Atomove Elektrarne Mochovce, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The aspects are discussed of the building up of an information system for production control and evaluation at the Mochovce nuclear power plant. The functions are listed which the information system must fulfil. As against the nuclear power plants at Jaslovske Bohunice and Dukovany where a conventional information system is the basic source of information for the operator, the information system in Mochovce will use pointer and recording instruments placed in the unit control room for presentation of only those variables whose analog expression is more favourable than is their digital expression. The basic source of information for the operator will be the computer subsystem which will record data from the production process, process it and transmit information either automatically or upon command by the operator. The main hardware of the said system includes the SM 1804 microcomputer and the Deris microprocessor control system. A brief characteristic is presented of possibilities for training personnel for the operation and maintenance of the microprocessor system. (Z.M.).

49660 (INIS-mf—10958, pp 140-147) **Control and evaluation of the production and maintenance of measuring and control equipment of a nuclear power plant.** Kerak, J. (Atomova Elektraren Bohunice, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The set of measurement and control equipment available at the V-1 and V-2 nuclear power plants at Jaslovske Bohunice comprises both special measurement and control systems with broad internal ties, a great number of elements and a relatively small number of ties to basic technological equipment, and individual measurement and control circuits. The latter are characterized by simpler internal ties and greater ties to technological equipment. At the V-1 power plant this comprises about 7000 circuits and 250,000 elements, at the V-2 plant 10,000 circuits and 360,000 elements. Care of the equipment comprises servicing and corrective and preventive maintenance. The size of the set requires the introduction of an automated control system using a computer. The results are presented of projecting such an automated system which includes preventive maintenance, random maintenance, labour and material and technical provision. It is stated that the significance of the automated system consists in increased accuracy and labour savings as well as in the introduction of such operations as is the determination of preventive maintenance of measurement and control circuits which will agree with the terms of routine repairs and overhauls of machine equipment, which would not be possible without computer technology. (Z.M).

49661 (INIS-mf—10958, pp 211-218) **Control system of 1000 MW units of Temelin nuclear power plant.** Kadlec, Z. (Energoprojekt, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The system of unit control for the Temelin nuclear power plant may be divided into three subsystems: the computer-based information system, the system of discrete control (logical control) and the system of continuous control (automatic control). The hardware of the computer system is Soviet made and consists of four systems of SM 1210 computers, four concentrators based on the SM 50/60 computer and seven RMOT operator stations equipped each with two colour semigraphic displays, one black and white alphanumerical display, a technological keyboard, an alphanumerical keyboard and a printer. The function of the system of discrete control is provided by firmly interconnected hardware based on the DIAMO O-K system serving the fulfilment of all protective functions and on MODIN units providing nonlinear conversion of sensor signals, etc., and with programmable hardware, such as the DASOR-601 control system. This system provides data entry and also fulfils control tasks. In the system of continuous control the control circuits are, according to their assignment to technological functional units, also implemented by the DASOR-601 control systems, with the exception of independent control units for reactor and turbine power output. (Z.M.).

49662 (INIS-mf—10958, pp 219-229) **Upgrading information and computation systems of automated control system of WWER-type units of nuclear power plants.** Martancik, J.; Gese, A.; Beno, T. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The program is described of upgrading the information system of the V-1 nuclear power plant at Jaslovske Bohunice. The original Soviet IV-500 MA system is gradually being replaced with RPP-16S computers or with SM 15/13 computers. A detailed description is presented of the individual modules of software of the unit computer with regard to their function in the process of power plant unit control. These include a module of the cyclic collection of values of technological variables, the module of the primary processing of these values, the module for protocol imaging and printing, the module for the communication of the operator of the technological process with the computer and a set of aplication program modules which serve the calculation of selected parameters needed for providing an economical operation of the unit. Also indicated are the main trends of cooperation with the Soviet General Project Designer in the upgrading of nuclear power plant information systems. (Z.M.).

49663 (INIS-mf—10958, pp 237-246) **In-core measuring systems. Current state and prospects of development.** Gese, A.; Stanc, S. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

A brief characteristic is presented of the state and prospects of the development of the system of in-core measurement in different parts of the world. The systems of in-core measurement operated in Czechoslovak nuclear power plants are described. At the V-1 nuclear power plant in Jaslovske Bohunice these tasks are provided by the VOLNA system for measuring the distribution of neutron flux along the height of the reactor core and the IV-500 MA for measuring thermal parameters. In connection with the installation of the RPP-16S control computer system these possibilities have been broadened by measurements and evaluations of coolant heating in the reactor core. In the V-2 Jaslovske Bohunice and Dukovany plants in-core measurements are made using the HINDUKUS system which provides the collection of values of neutron flux, the temperature of the coolant at the outlet of fuel assemblies and of other variables of the primary circuit, their processing and the printout of protocols of these measurements. The HINDUKUS system is not connected to the KOMPLEX-URAN, automated system of technological process control installed at all three mentioned power plants. Wider possibilities of in-core measurement will be provided by hardware and software of the DERIS microcomputer system which will be installed at the Mochovce and Temelin power plants. (Z.M.).

49664 (INIS-mf—10958, pp 247-253) **Semigraphic information imaging at power unit control room.** Irman, F. (Vyskumny Ustav Energeticky, Bratislava, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

A semigraphic colour display device was developed for computer-based information systems in Czechoslovak nuclear power plants. This is an intelligent terminal which receives data on the state of the power plant unit from the unit or the standby computer of the information system. The terminal has its own microcomputer, the SM 50/40 which in its memory stores data on the form of display, static background, etc., so that from the information system it only needs the current values of monitored data. The terminal consists of standard modules of the SM 50/40 modular system, the only non-standard part is the interface card serving the connection of the ODI-6310 display which in pairs provide the display of information and which do not have the interface to computers of the SMEP series, for paging and for communication with computers of the information system. The terminal is at present connected to the RPP-16 computer but communication with computers of the information system is by serial transfer and thereby independent of the computer type. (Z.M.).

49665 (INIS-mf—10958, pp 254-262) **Microprocessor system of organized and automated acquisition and processing of two-state analogue signals with a rated frequency of 50 Hz and its use in nuclear power generation.** Dopjera, J.; Ziska, D.; Kicina, S.; Bartosik, F.; Patras, V.; Demovic, I.; Spal, M. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

A microprocessor system has been developed for automated monitoring and analysis of transient states of diverse electric equipment of nuclear power plants. It allows organized and automatic acquisition and processing of analog and binary variables of a nominal frequency of 50 Hz. The practical use of the system is, for instance, the diagnostics of electric equipment generating power for own consumption of the nuclear power plant and the systems of power generation, as well as for optimizing the performance of electric protection and algorithms of selected automatic operations. Two types of linearized current converters and voltage measurement converters were developed to allow heavy current inputs into the microprocessor system. The microprocessor system consists of standard modules of the SM 53/10 system and has the following basic configuration: process interface terminal, videoterminal, graphic recorder and printer. This configuration may be modified and completed with other standard modules of the SMEP computer series, which will further broaden its uses. (Z.M.).

49666 (INIS-mf—10958, pp 263-270) **Control of fields of physical variables as distributed parameter systems in nuclear power generation.** Hulko, G.; Kocsis, M. (Slovenska Vysoka Skola Technicka, Bratislava, Czechoslovakia; Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Some aspects are discussed of the theory of reactor control, namely with regard to the concept of the reactor as being a system with distributed parameters. It is underlined that hardware is already available for their practical application. Thus, for instance, in-core measurement shows that in nuclear power, technical problems of measuring fields of physical variables are practically nonexistent. The use of the results of these measurements should result in qualitatively new levels of reactor control which would bring about step changes in reactor efficiency. The design of reactors should also be optimized, i.e., improvements should be made in the number and distribution of measurement elements and actuators and in reactor shape, all this with regard to the optimal interaction of fields of physical variables, etc. The ideal diagram is given of the control system of a 1000 MW reactor. (Z.M.).

49667 **(KFKI—1987-28/M) VERONA-plus: extended core-monitoring system for WWER-440 type nuclear power plants.** Adorjan, F.; Banati, J.; Buerger, L.; Kantor, G.; Kereszturi, A.; Szabo, L. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). May 1987. 10p. (CONF-8705192—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700130.

From Nuclear power plant control and instrumentation IAEA/NPPCI specialists' meeting; Roskilde, Denmark (25 May 1987).

The paper discusses the new extended version of the VERONA Core Monitoring system which was put into operation in Unit 3 of Paks NPP. The new functions of the system partly help the operator to plan power modification manoeuvres, partly support the safety and economic management of the plant by presenting the working conditions in various ways and performing some technical-economic calculations. 5 refs.

49668 **(UFRJ-COPPE-PEN—137) Influence of the demand rate and repair rate on the reliability of a single-channel protective system.** Oliveira, L.F.S. de; Amaral Neto, J.D. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). Mar 1986. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703665.

An expression for the plant hazard rate of a plant equipped with a single-channel protective system using a markovian model was derived. The expression includes the effects of the demand rate and the channel repair rae. It is shown that within the typical range of system failure rate, demand rate and proof-test interval, the plant hazard rate is not very sensitive to significant variations of the repair rate. A numerical comparison of the obtained results with those from other equivalent expressions suggested in the literature is presented, and it is shown that some of those expressions can be ontained as a particular case of the purposed expression.

49669 **(UFRJ-COPPE-PEN—138) New concept of safety parameter display system.** Martinez, A.S.; Oliveira, L.F.S. de; Schirru, R.; Thome Filho, Z.D.; Silva, R.A. da. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). Jul 1986. 19p. (CONF-8607339—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703666.

From Seminar on nuclear engineering in Latin America; Mexico City, Mexico (14 Jul 1986).

A general description of Angra-1 Parameter Display System (SSPA), a real time and on-line computerized monitoring system for the parameters related to the power plant safety is presented. This system has the main purpose of diminish the load on the Angra-1 power plant operators at an emergency event by supplying them with the additional tools serving as the basis for a prompt identification of the accident. The SSPA is a kind of safety parameter display system whose concept was introduced after Three Mile Island accident in USA. The SSPA comprises two nuclear applications independently considered. They are included into the Parameters Monitoring Integrated System (SIMP) and the safety critical function system (SFCS).

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 49414, 49415, 49546, 49562, 49563, 49564, 49565, 49641, 49643, 49644, 49645, 49646, 49647, 49648, 49700, 49705, 49711, 49728

49670 **(GEND—062) Catalyst tests for hydrogen control in canisters of wet radioactive wastes.** Henrie, J.O.; Bullough, B.D.; Flesher, D.J. (EG and G Idaho, Inc., Idaho Falls (USA)). Aug 1987. Contract AC06-77RL01030. 31p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000445.

Catalyst beds are used in the Three Mile Island Unit-2 (TMI-2) core debris canisters to recombine radiolytic hydrogen and oxygen and prevent the buildup of flammable mixtures. This document describes a unique test system for determining the effectiveness of catalyst beds in chemically combining hydrogen and oxygen gases in closed containers and without forced convection. The test system was used to determine the effects of catalyst type, catalyst bed size and shape, cover gas type and pressure, and various additives and contaminants on catalyst performance. The test program demonstrated that a mixture of specific Engelhard and Atomic Energy of Canada Limited (AECL) catalysts performed better than either catalyst performed separately. When the Engelhard catalyst is dry and well-exposed to the reactive gases, its effectiveness is a factor of approximately 100 greater than when it is dripping wet. The AECL wet-proof catalyst is not as effective as the Engelhard catalyst, but it is not as sensitive to the presence of water. The various additives and contaminants to which the catalyst might be exposed during its life cycle had little effect on catalyst performance; contaminants appear to be effectively removed by the rinsing processes which occur.

49671 (IWGFPT—25, pp 43-54) **Basic thermodynamic and transport properties of some fission products in oxides and intermetallic systems relevant to the behaviour of nuclear fuel.** Dharwadkar, S.R.; Chattopadhyay, G.; Tripathi, S.N.; Bharadwaj, S.R.; Naik, M.C.; Paul, A.R.; Kaimal, K.N.G.; Chandrasekharaiah, M.S.; Venkateswarlu, K.S. (Bhabha Atomic Research Centre, Bombay, India. Water Chemistry Div.). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

Some recent thermodynamic and transport investigations carried out in our laboratory on the systems involving fission products and the fuel component are reported in this paper. The data presented comprise of equilibrium phase diagrams of U-Mo-O, and Pd-Te systems, the standard free energies of formation of two ternary compounds, UMoO/sub 5/ and UMoO/sub 6/ and the thermal stability of Cs/sub 2/UO/sub 4/ in air. Transport investigations deal with release behaviour of /sup 133/Xe and /sup 131/I from UO/sub 2/ and ThO/sub 2/ matrices at low burnup (<1x10/sup 21/ fissions/m/sup 3/), the effect of altervalent dopants Y/sup +3/ and Nb/sup +5/ on their release behaviour and the effect of burnup on atomic migration of Xe and I in the above matrices. The U-Mo-O system was investigated to know the possibility of the formation of ternary phases by the interaction of the fission product Mo with the fuel UO/sub 2/ in the irradiated fuel pin of calcined waste. The following conclusions were drawn. 1. No ternary compound in U-Mo-O system will be formed in oxide fuel pin under irradiation, even at highest burnup of 10 a/o. The ternary compound UMoO/sub 5/ co-exists with UO/sub 2.116/ and MoO/sub 2/ at 1000K at the oxygen potential of about -218kJ/mol. 2. Uranium molybdate UMoO/sub 6/ will not be formed in nuclear waste calcined in air because of high thermodynamic stability of alkaline earth and rare earth molybdates. The transport investigations of Xe and I in UO/sub 2/ and ThO/sub 2/ matrices yielded the following results. 1. At low burnup the release rate of Xe from irradiated oxide fuel is not influenced by addition of altervalent ions in the UO/sub 2/ and ThO/sub 2/ lattices. Iodine release rate however, is influenced substantially. 2. Diffusivity of Xe is reduced drastically at higher burnups but the release rate of iodine is increased considerably under similar conditions. 40 refs, 8 figs, 4 tabs.

49672 **(NAGRA-NTB—86-16) Survey of the working programme for the potential site of Bois de la Glaive (community of Ollon, VD). Feasibility investigation of sites for a final repository of low-and intermediate-level radioactive wastes.** (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Feb 1987. 42p. (In French). Nagra, CH-5401 Baden, Switzerland.

On 30/sup th/ September 1985, the Federal Government licensed site-suitability investigations in three areas with a view to disposal of low- and intermediate-level radioactive waste. This report gives an outline of the corresponding research programme at the potential site at Bois de la Glaive. The first part of the report begins with some comments on the concept of radioactive waste disposal and on some basic aspects of site-specific exploration and investigation. The governmental decision of 30/sup th/ September and Nagra's two-phase investigation concept are then briefly considered. To close, the objectives of investigation phase I are outlined and possible results are briefly discussed. The research programme developed for investigation of the potential site at Bois de la Glaive is presented in the second part of the report. Besides geological and hydrogeological investigations at the surface, the programme includes a geophysical survey and the drilling of five to ten piezometers. The planned geophysical investigation consists of eight short geophysical profiles (length 600 to 1500 m) for investigation of the geometry of the gypsum cover on top of the potential host rock (anhydrite) and of two reflection seismic profiles, each 4000 m in length, to study the geometry and the homogeneity of the anhydrite. The purpose of these investigations is to verify, in a first phase, the geological forecasts that have been taken as a basis for selecting the potential site at Bois de la Glaive. The aim of the piezometers is to provide basic data on the alluvial fill of the Rhone plain. The following sections are devoted to possible additional work and the time-planning of investigation phase I. The third part

of the report gives a brief overview of the most important investigations in the research programmes for the other two potential sites, Oberbauenstock and Piz Pian Grand.

49673 **(SEPRAD—07/86) Discussion of 10 CRF 20 rules for waste of effluents in sanitary sewerage.** Rocha, A.C.S. da; Pina, J.L.S. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). Dec 1986. 50p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703657.

An interpretation of the Code of Federal Regulations, volume 10 part 20 (10 CFR 20) from Nuclear Regulatory Commission is proposed, aiming at his easier use in waste of radioactive liquid effluents to the environment, by sanitary sewerage. The study is based on recommendations of International Commission of Radiological Protection (ICPR 2) and International Atomic Energy Agency (Basic Safety Standards for Radiation Protection). (M.A.C.).

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REFER ALSO TO CITATION(S) 49533, 49581, 49654, 49656, 49709, 49710, 49726, 49881, 49915, 49916, 49918

49674 **(BNL-NUREG—39935) DHCVIM: A direct heating containment vessel interactions module: Applications to Sandia National Laboratory Surtsey experiments.** Ginsberg, T.; Tutu, N.K. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 13p. (CONF-871101—38). NTIS, PC A02. File Number DE87012173.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

Direct containment heating is the mechanism of severe nuclear reactor accident containment loading which results from transfer of thermal and chemical energy from high temperature, finely divided, molten core material to the containment atmosphere. The Direct Heating Containment Vessel Interactions Module, DHCVIM, has been developed at BNL to mechanistically model the mechanisms of containment loading resulting from the direct heating accident sequence. The calculational procedure is being used at present to model the Sandia National Laboratory 1/10th-scale Surtsey direct containment heating experiments. The objective of the code is to provide a test bed for detailed modeling of various aspects of the thermal, chemical and hydrodynamic interactions which are expected to occur in three regions of a containment building: reactor cavity, intermediate subcompartments and containment done. Major emphasis is placed, at present, on the description of reactor cavity dynamics. This paper summarizes the modeling principles which are incorporated in DHCVIM and presents a prediction of the Surtsey Test DCH-2 which was made prior to execution of the experiment.

49675 **(CONF-871101—17) Subassembly flow distributions implied from measured temperature in EBR-II [Experimental Breeder Reactor II] subassemblies.** Koenig, J.F.; Lahm, C.E. (Argonne National Lab., Idaho Falls, ID (USA)). 1987. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011368.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This paper presents calculations carried out for coolant flow and temperature distributions in the EBR-2 reactor. Measurements made in the reactor were compared to predictions from the heat transfer code COBRA. The author concludes that predicted temperatures were in very good agreement with actual values. 2 refs., 2 tabs. (JDH)

49676 **(CONF-8709134—1) Design and use of the ORNL HFIR [High Flux Isotope Reactor] pneumatic tube irradiation systems.** Dyer, F.F.; Emery, J.F.; Robinson, L.; Teasley, N.A. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000331.

From 2. international workshop activation analysis with short-lived nuclides; Vienna, Austria (21 Sep 1987).

A second pneumatic tube that was recently installed in the High Flux Isotope Reactor for neutron activation analysis is described. Although not yet tested, the system is expected to have a thermal neutron flux of about 1.5×10^{14} cm^{-2} s^{-1}. A delayed neutron counter is an integral part of the pneumatic tube, and all of the hardware is present to enable automated use of the counter. The system is operated with a Gould programmable controller that is programmed with an IBM personal computer. Automation of any mode of operation, including the delayed neutron counter, will only require a nominal amount of software development. Except for the lack of a hot cell, the irradiation facility has all of the advantageous features of an older pneumatic tube that has been in operation for 17 years. The design of the system and some applications and methods of operation are described.

49677 (IAEA-TECDOC—409, pp 299-312) **Research reactor as a tool for research in physics.** Rao, K.R.; Dasannacharya, B.A. (Bhabha Atomic Research Centre, Bombay, India. Nuclear Physics Div.). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

Thermal neutrons from research reactors have been used during the past three decades in studies of various aspects of condensed matter physics and nuclear physics. At Trombay, the CIRUS Reactor has been extensively used in basic and applied studies. The paper reviews neutron scattering and radiographic work done with CIRUS and APSARA reactors. This will include results on structure with dynamics of amino-acids, spins-structures of ferrites, texture studies on uranium, particle size/grain boundary measurement in beryllium, photon studies in ferroelectrics, etc. DHRUVA, the latest Research Reactor at Trombay, will be the highest neutron flux facility (nearly 2 x 10/sup 14/n/cm/sup 2/-sec) in India when it becomes critical in the near future. The design of the reactor pile block has been incorporated with recessed cavities and cut-aways that allow the experimenters to approach closer to the source. Several new spectrometers are under fabrication for installation. In order to increase the through-put, multiple detectors, position-sensitive detectors, focussing monochromators and a MARX analyzer are incorporated in these spectrometers. The spectrometers will all be automated for control, data acquisition and processing using microcomputers. The paper will also describe the facilities being installed at DHRUVA and the planned experimental programme. 7 refs, 7 figs.

49678 (IAEA-TECDOC—409, pp 325-332) **Increasing utilization of research reactors.** Bao Wanping. (Academia Sinica, Beijing, BJ, China. Inst. of Atomic Energy). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

There are two higher power research reactors in IAE. One is the Heavy Water Research Reactor (HWRR), another is the Swimming Pool Reactor (SPR). Two reactors have been operating for more than 20 years. They have made an important contribution in the areas of neutron scattering experiments, irradiation for radioisotope production, activation analysis, biological experiments, fuel and material irradiation and personnel training. In recent years, in order to provide valuable income and increase utilization of research reactors, the research of reactor irradiation technology application was emphasized. Major progress has been made in the areas of neutron doping. Since 1979, the research of neutron transmutation doping in semiconductor materials has been performed. The year's output of NTD silicon in 1984 was 3.2 tons. An output of 4 tons in 1985 is expected. We have started to engage in preparation of nuclepore membrane filters and its application. It is expected that the nuclepore membrane filters will be used in the areas of medical analysis; ultra-pure reagent preparation and environmental protection analysis, etc. 5 figs, 3 tabs.

49679 (IAEA-TECDOC—409, pp 333-338) **Operation and utilization of the Swiss Research Reactor SAPHIR.** Winkler, H.; Buehrer, W. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen, Switzerland; Labor fuer Neutronenstreuung, Wuerenlingen, Switzerland). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The Reactor SAPHIR is a swimming-pool-reactor with MTR type fuel elements. It became critical in April 1957 at Wuerenlingen and operated at a power of 1MW. After several modifications and improvements during the years the power has been successively increased. SAPHIR has operated since January 1984 at a thermal power of 10MW. Todays operation schedule is 3 weeks full power followed by one week low power operation. So a total of about 330 days of operation per year is achieved. At full power operation the reactor will mainly be used for: Beam hole experiments: four 2 and 3 Axis Spectrometers are in operation mainly for solid state physics; Isotope production for medical and industrial applications; Material Testing, especially examination of pressure vessel steel; Activation analysis; Silicon doping and other irradiation services; Irradiation Tests of low enriched MTR fuel elements (RERTR-Program). In the low power operation phase the reactor is used for: Training and education of power station operating personnel and students; Experiments in connection with improvements of the reactor and safety systems. The following presentation will treat mainly the operational aspects, improvements made for experimental equipment and some applications. 4 figs.

49680 (IAEA-TECDOC—409, pp 339-348) **Applied research and service activities at the University of Missouri Research Reactor Facility (MURR).** Alger, D.M. (Missouri Univ., Columbia, USA). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The University of Missouri operates MURR to provide an intense source of neutron and gamma radiation for research and applications by experimenters from its four campuses and by experimenters from other universities, government and industry. The 10 MW reactor, which has been operating an average of 155 hours per week for the past eight years, produces thermal neutron fluxes up to 6-7 x 10/sup 14/ n/cm/sup 2/-s in the central flux trap and beamport source fluxes of up to 1.2 x 10/sup 14/ n/cm/sup 2/-s. The mission of the reactor facility, to promote research, education and service, is the same as the overall mission of the university and therefore, applied research and service supported by industrial firms have been welcomed. The university recognized after a few years of reactor operation that in order to build utilization, it would be necessary to develop in-house research programs including people, equipment and activity so that potential users could more easily and quickly obtain the results needed. Nine research areas have been developed to create a broadly based program to support the level of activity needed to justify the cost of operating the facility. Applied research and service generate financial support for about one-half of the annual budget. The applied and service programs provide strong motivation for university/industry association in addition to the income generated.

49681 (IAEA-TECDOC—409, pp 349-367) **Utilization of research reactors at Trombay.** Sundaram, S.M. (Bhabha Atomic Research Centre, Bombay, India). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The three thermal research reactors at Trombay, Apsara (400 kW), Cirus (40 MW) and Zerlina (100 W) have played a vital role in furthering the programme of nuclear research and development in India. Dhruva, a 100 MW thermal research reactor, has been built and is presently under commissioning. The reactors have been extensively utilized not only for basic research in the fields of nuclear physics, solid state physics, chemistry and biology, but also for the development of techniques in neutron activation analysis, neutron radiography, etc. Operation of these reactors have also enabled production of large quantities of radioisotopes for industrial and medical applications to meet our growing needs. The research reactors have been effectively used as a training tool for manpower development in various disciplines for our nuclear power programme. With the commissioning of Dhruva, enhanced production of a variety of radioisotopes used in medical diagnosis and therapy will also be met. 1 ref, 2 figs, 10 tabs.

49682 (IAEA-TECDOC—409, pp 19-61) **Past, present and future uses of the BR2 materials testing reactor.** Baugnet, J.M.; Leonard, F. (Centre d'Etude de l'Energie Nucleaire, Mol, Belgium). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The BR2 reactor (Mol, Belgium) is a high-flux materials testing reactor. The fuel is 93% /sup 235/U enriched uranium. The nominal power ranges from 60 to 100 MW. The main features of the design are the following: maximum neutron flux: thermal : 1.2 x 10/sup 15/ n/cm/sup 2/s, fast (E>0.1 MeV) : 8.4 x 10/sup 14/ n/cm/sup 2/s; great flexibility of utilization : core configuration adapted to the experimental loading; possibility of tailoring the neutron spectrum; besides the standard channels (84 mm diameter), five 200 mm diameter channels are available. The reactor is used to study the behaviour of reactor fuel elements and structural materials intended for future nuclear power stations of several types (fission and fusion). The irradiations concern performance tests up to very high burn-up or neutron fluence values on the one hand, and safety experiments, power cycling experiments, and generally speaking irradiations under off-normal conditions on the other. Irradiations for nuclear transmutation (production of high specific activity radio-isotopes), neutron-radiography, use of beam tubes for physics studies, and pilot scale gamma irradiations are also carried out. The paper deals with the following items: general introduction to the BR2 reactor; operational characteristics; neutronic aspects; survey of some typical experiments, already carried out or under development in support of the development of: light water reactors, high temperature gas cooled reactors, sodium cooled fast reactors, gas cooled fast reactors, fusion reactors, possible new features. 27 refs, 29 figs, 9 tabs.

49683 (IAEA-TECDOC—409, pp 251-261) **Testing of power reactor fuel types in the DR3 reactor at Risoe.** Knudsen, P.; Misfeldt, I. (Risoe National Lab., Roskilde, Denmark; Atlas-Denmark AS, Ballerup. Advanced Engineering Div.). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

Fuel testing is an important part of the Danish fuels development program. Consequently, facilities have been developed that permit testing of UO/sub 2/-Zr fuels in the DR3 reactor at RISOE under realistic conditions simulating those of BWRs and PWRs. These facilities are also being used in internationally sponsored projects. The present paper gives a brief summary of the Danish fuels program and the associated DR3 facilities. Examples are presented of the investigations performed. Finally, an overview is given of the three RISOE projects to study fission gas release behavior of water reactor fuels. 7 refs, 6 figs.

49684 (IAEA-TECDOC—410, pp 409-421) **Research high flux reactor PIK.** Konoplev, K.A. (Leningrad Inst. of Nuclear Physics, USSR). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The research reactor is now under construction at the Leningrad Institute of Nuclear Physics, 45 km away from the city. The

projected power of the reactor is 100 Mwt. The reactor will be used for physical investigations with external neutron beams. The thermal neutron flux in the reflector is higher than 10/sup 15/ neutrons/cm/sup 2/ sec and the flux in the usual water trap in the centre of the core is 4.10/sup 15/ neutrons/cm/sup 2/ sec. Sources of cold and fast neutrons are designed in the reactor. Most of the experiments will be conducted on stationary neutron guides. 14 refs, 16 figs, 2 tabs.

49685 (IAEA-TECDOC—410, pp 421-427) **New intense source of very-cold and ultra-cold neutrons.** Michaudon, A. (Institut Max von Laue - Paul Langevin, 38 - Grenoble, France). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

This paper presents a new source of very cold and ultra-cold neutrons recently put into operation at the High-Flux Reactor of the Institut Laue-Langevin in Grenoble (France). This source consists of a primary source of liquid deuterium, a set of metallic nickel vertical and curved guides and a neutron turbine. Results about the flux and density of very low energy neutrons are given both at the exit of the curved guide and after the neutron turbine. A preliminary list of experiments that will be carried out with this new source is also presented. 19 refs, 5 figs.

49686 **(INIS-BR—759) Fabrication of the fuel elements cladding for utilization in the fluidized bed nuclear reactor.** Schaeffer, L.; Sefidvash, F. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 4p. (In Portuguese). (CONF-861299—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703509.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

A method for the fabrication of cladding of the spherical fuel elements for the utilization in the fluidized bed nuclear reactor is presented. Some prelimminary experiments were performed to adopt a method which adapt itself to mass production with the desired high quality. Still methods for cladding fabrication are under study.

49687 (JAERI-M—86-178, pp 32-44) **Critical experiment and analysis at FCA.** Osugi, Toshitaka; Ohno, Akio; Yoshida, Hiroyuki. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

A series of experiment have been performed at FCA to fill the gap between the measured and predicted characteristics of a High Conversion Light Water Reactor (HCLWR), namely infinite multiplication factor (k_∞), conversion ratio, moderator voidage effect and control rod reactivity worth. The experiment consists of three steps, phase-I (plate-type enriched uranium fueled core), Phase-II (plate-type plutonium fueled core) and Phase-III (pin-type mixed oxide fueled core). The first stmulated core in phase-I experiment, the FCA-XIV-1 core, went critical in May 1986. The FCA-XIV-1 core is a coupled system which consists of a central test region and outer driver region. The fuel enrichment of the test region is 6.5% U-235 and the moderator-to-fuel volume ratio 0.6. Analyses for K_∞ of the test region and criticality in the FCA-XIV-1 core have been made using the JENDL-2 library and the SRAC code system. The calculated values of K/sub eff/ and K_∞ showed good agreements with measured values and the same C/E value of 0.992 was obtained for K/sub eff/ and K_∞.

49688 (JAERI-M—86-178, pp 162-175) **Data base system for reactor physics experiments at KUCA, 2.** Wakamatsu, Susumu; Nishina, Kojiro. (Nagoya Univ., Japan. Faculty of Engineering). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

In the last twelve years, numerous core-loading patterns have been employed at KUCA for the implementation of characteristic experiments. As the information on these patterns is considered instructive for the future experiments, its data base has been produced. The data base system utilizes a sixteen-bits personal computer. The core-loading pattern is displayed on a color CRT by the graphic functions of Japanese-compatible N/sub 88/-Basic in MS-DOS system. The fuel assemblies, control and safety rods, various detectors, other experimental equipments and the figure explanations are displayed. The system utilizes (1) random files for storing numerical data of the core pattern display, and (2) sequential files with the experimental number as a parameter, the latter intended to reduce the retrieval time. The retrieval is made by the experimental number in about twenty seconds (by using the computer PC-9801VM). By connecting a color printer to the system at one's option, he gets a hard copy of the core-loading pattern in color (in about ten minutes). We have already entered the 714 patterns that were loaded during the first ten years of the assembly operation, namely 1974 - 1984.

49689 (JAERI-M—86-178, pp 141-160) **Data base for reactor physics experiments at KUCA, 1.** Ichihara, Chihiro; Hayashi, Masatoshi; Fujine, Shigenori; Wakamatsu, Susumu. (Kyoto Univ., Kumatori, Osaka, Japan. Research Reactor Inst.). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

A data base of the experiment done at the Critical Assembly of Kyoto University(KUCA) was constructed both on personal computers and a main frame. A retrieval data base based on each experiment serve as the key data base. The critical experiment data, geometries of the core configuration or fuel elements, and the various numeric data are referred after the results of the retrieval. The personal computer program for this data base is made using BASIC language and the whole system consist of the retrieval data base and the graphic data. The construction of the critical experiment data is now in progress. The data base system can be supplied to the KUCA users with floppy disks. A universal information retrieval system, FAIRS is prepared at the Data Processing Center Kyoto University. By using this system, the retrieval data base of the experiment was constructed. The image information such as core configuration and fuel elements are stored by using ELF system which can be linked to the FAIRS. The data base on FAIRS can be referred from each university through an online network. However, ELF is a closed service within Kyoto University at present.

49690 **(JAERI-M—86-191) Measurements of relative power distributions in the simulated axially heterogeneous core (FCA XIII core) by γ-scanning method.** Satoh, Kunio; Ohno, Akio; Osugi, Tositaka; Sato, Wakaei. (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. 80p. (In Japanese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703613.

Relative power distributions were measured using γ-scanning method in the partially simulated cores of axially heterogeneous LMFBR (FCA XIII-1 and FCA XIII-2 core) which were assembled to study radial nuclear characteristics of the core. Radial power flattenings and a radial variation of channel powers were examined from the power distributions measured in the cores having the inner blanket at the core midplane. It is confirmed that the power flattenings can be achieved not only in the axial distribution but in the radial distribution. The distribution of the channel powers also can be more flattened by making optimization of the inner blanket shape. Calculation predicts the overall trend of the measured results. Calculated results agreed well with measured values in the core rigion, while underestimated in the inner and outer blanket region. As for the channel power distribution and the power peaking factor, calculated values agree with measured ones.

49691 **(JAERI-M—87-006) Fundamental experiments on closed thermosyphon for JRR-3 cold neutron source, (1).** Kumai, Toshio; Sakamoto, Masanobu; Takahashi, Hidetake; Shinozu, Kazuo. (Japan Atomic Energy Research Inst., Tokyo). Feb 1987. 22p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703622.

An experimental study has been performed to understand the characteristics of the closed two-phase thermosyphon by using Freon-113 as working fluid for JRR-3 cold neutron source which has a double wall thermosyphon system. The experimental apparatus was made of glass in order to permit visual and photographic observations. The purposes of this experiment were mainly focused on the effect of the presence of inner tube on the heat transfer limit, the visual observations of the flow conditions of fluid and the condensation conditions of fluid in the condenser. It is found that in the case of the single tube, experimental results on the heat transfer limit agree with the values which are given by Wallis's correlation equation, whereas in the case of the double tube, the presence of the inner tube increases the heat transfer limit by about 200 W.

49692 **(KFKI—1987-07/G) Reactor operation based on subchannel approach at the WWER-440 reactor of the Paks Nuclear Power Plant. Pt. 1. A calculation method applicable to the VERONA system.** Szabados, L.; Biro, E.; Ezsoel, Gy.; Maroti, L.; Perneczky, L.; Toth, I.; Trosztel, I.; Vigassy, J. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jan 1987. 42p. (In Hungarian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703630.

To reveal the power reserves of the reactor units of the Paks Nuclear Power Plant a long-term research project was elaborated. As the first part of this program a simplified computer code for the thermohydraulic calculations based on subchannel approach and an algorithm appropriate for the selection of the hot channel was developed. Calculation methods verified by operational data, and experimental results of a high pressure loop were presented for the reactor operators. Subroutines of the COCONT code also applicable to the VERONA system are described in detail. (V.N.). 5 refs.; 4 figs.; 4 tables.

49693 (KURRI-TR—281, pp 1-6) **Application of CO/sub 2/ laser beam weld for repair of fuel element of nuclear reactor 'YAYOI'.** Hashimoto, Mitsuo; Yanagi, Hideharu; Sukegawa, Toshio; Saito, Isao; Sasuga, Norihiko; Aizawa, Nagaaki; Miya, Kenzo. (Tokyo Univ., Tokai, Ibaraki, Japan. Nuclear Engineering Research Lab.). Aug 1986. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780168. (CONF-8508242—).

From 6. symposium on the development of advanced technology for scientific research; Osaka, Japan (19 Aug 1985).

The present studies are to develop CO/sub 2/ laser beam welding techniques in order to apply for repoint of nuclear reactor fuel of Fast Neutron Source Reactor YAYOI. For that purpos, many experiments were conduted to obtain various effects of laser welding variables with use of SUS 304 plates, pipes and simulated dumy fuels. These experiments provided us an optimal welding condition through metallurgical observations, non-destructive and mechanical tests. It was found that the laser welds exhibited properties equivalent to those of the base metal, in addition they provided us a favorable system than that of electron beam welds against a cladding of radioactive nuclear fuel in a hot cell. The present paper reports on the characteristics of laser welds, structural analysis of fuel element and a system design of remotely operated devices setting in a hot cell.

49694 **(KURRI-TR—282) Proceedings of 7th short conference on neutron radiography.** Hiraoka, Eiichi; Katsurayama, Kousuke; Tsujimoto, Tadashi (eds.). (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Oct 1986. 145p. (In Japanese). (CONF-8508247—). NTIS (US Sales Only), PC A07/MF A01. File Number DE88700062.

From 7. short conference on neutron radiography; Kumatori, Japan (20 Aug 1985).

The first short period conference on neutron radiography was held in 1970, and now the 7th meeting was held. The works to develop neutron radiography in Japan are as active as those in western countries, and the research is in progress by using neutrons from reactors, radioisotopes and accelerators in order to achieve the technology of high standard. In this conference, 26 papers and six comments were presented, and the themes covered the equipment for radiography, the practical application, and the related research. The second World Conference on Neutron Radiography will be held in Paris in June, 1986, and the further promotion of the spread of neutron radiography can be expected. The proceedings of the conference is published with the hope that joint effort and information exchange are further enhanced in coming years to develop the neutron radiography in Japan. The neutron radiography using the Kinki University reactor, the Rikkyo Triga-2 reactor, the Musashi reactor, the Kyoto research reactor, a 3MV Van de Graaff accelerator in Toyota, a subcompact cyclotron in Sumitomo, a baby cyclotron-dual collimator in National Space Development Agency and so on, Cf-252 based thermal neutron radiography, CT with Sb-124/Be neutrons, pulse power neutron source, imaging converters, neutron radiographic image processing, computed tomography using neutron television systems and others are reported. (Kako, I.).

49695 **(KURRI-TR—284) Research on the reactor physics using the Kyoto University Critical Assembly (KUCA).** (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Oct 1986. 75p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703631.

The Kyoto University Critical Assembly [KUCA] is a multicore type critical assembly established in 1974, as a facility for the joint use study by researchers of all universities in Japan. Thereafter, many reactor physics experiments have been carried out using three cores (A-, B-, and C-cores) in the KUCA. In the A- and B-cores, solid moderator such as polyethylene or graphite is used, whereas light-water is utilized as moderator in the C-core. The A-core has been employed mainly in connection with the Cockcroft-Walton type accelerator installed in the KUCA, to measure (1) the subcriticality by the pulsed neutron technique for the critical safety research and (2) the neutron spectrum by the time-of-flight technique. Recently, a basic study on the tight lattice core has also launched using the A-core. The B-core has been employed for the research on the thorium fuel cycle ever since. The C-core has been employed (1) for the basic studies on the nuclear characteristics of light-water moderated high-flux research reactors, including coupled-cores, and (2) for a research related to reducing enrichment of uranium fuel used in research reactors. The C-core is being utilized in the reactor laboratory course experiment for students of ten universities in Japan. The data base of the KUCA critical experiments is generated so far on the basis of approximately 350 experimental reports accumulated in the KUCA. Besides, the assessed KUCA code system has been established through analyses on the various KUCA experiments. In addition to the KUCA itself, both of them are provided for the joint use study by researchers of all universities in Japan. Contains 215 refs.

2207 Plutonium And Isotope Production Reactors

REFER ALSO TO CITATION(S) 49465, 49985

2209 Reactor Safety

REFER ALSO TO CITATION(S) 49998, 50309, 50706

49696 **(BNL-NUREG—39917) A comparative study of STCP and SCDAP simulation of PBF SFD Test 1-1.** Yang, J.W.; Khatib-Rahbar, M. (Brookhaven National Lab., Upton, NY (USA)). 1987. Contract AC02-76CH00016. 6p. (CONF-871101—19). NTIS, PC A02/MF A01 - GPO. File Number DE87011296.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This paper presents the results of a detailed comparison of the Source Term Code Package (STCP) and the SCDAP computer codes for simulation of the Power Burst Facility (PBF) Severe Fuel Damage (SFD) test 1-1. The SCDAP code is mechanistic, and has been benchmarked against a wide range of severe accident data. The SFD 1-1 test was designed to simulate the heatup and resulting fuel damage in the upper half of a 3000-Mw(t) PWR core approximately 2 to 3 hours after initiation of a small break accident, when the core is approximately 75% uncovered. 6 refs., 1 fig.

49697 **(BNL-NUREG—39929) Effect of reactor conditions on MSIV [main steam isolation valves]-ATWS power level.** Diamond, D.J. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 7p. (CONF-871101—50). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012121.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

In a boiling water reactor (BWR) when there is closure of the main steam isolation valves (MSIVs), the energy generated in the core will be transferred to the pressure suppression pool (PSP) via steam flows out of the relief valves. The pool has limited capacity as a heat sink and hence, if there is no reactor trip (an ATWS event), there is the possibility that the pool temperature may rise beyond acceptable limits. The present study was undertaken to determine how the initial reactor conditions affect the power during an MSIV-ATWS event. The time of interest is during the 20-30 minute period when it is assumed that the reactor is in a quasi-equilibrium condition with the water level and pressure fixed, natural circulation conditions and no control rod movement or significant boron in the core. The initial conditions of interest are the time during the cycle and the operating state. 4 refs., 2 tabs.

49698 **(BNL-NUREG—39932) An analysis of loss of offsite power with a PWR at shutdown.** Chu, T.L.; Yoon, W.H.; Fitzpatrick, R.G. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). Jun 1987. Contract AC02-76CH00016. 5p. (CONF-871101—39). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012113.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

In many Probabilistic Risk Assessments (PRAs), loss of offsite power (LOOP) when a nuclear power plant is operating was found to be a significant contributor to core damage. The purpose of this study is to provide an analysis of a loss of offsite power event that occurs while a PWR is shut down. The importance of such an analysis was recognized as part of a study to evaluate the core damage frequency due to a loss of decay heat removal capability during an outage. 5 refs., 1 fig.

49699 **(BNL-NUREG—39933) In-vessel flow characterization under severe accident conditions.** Nourbakhsh, H.P.; Kim, S.B.; Khatib-Rahbar, M. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 6p. (CONF-871101—37). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011921.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The purpose of this study is to provide a parametric framework for characterization of flow and heat transfer regimes and their associated phenomenological uncertainties following severe accidents using a two dimensional, heterogenous, porous media formulation. This approach extends the understanding of buoyancy-induced flow characteristics in the uncovered region of the reactor core and the upper plenum of a PWR vessel. The results of this study can be used to augment the boil-off steam flow in integrated one-dimensional severe accident codes such as the Source Team Code Package (STCP).

49700 **(BNL-NUREG—39934) A sensitivity analysis technique for application to deterministic models.** Ishigami, T.; Cazzoli, E.; Khatib-Rahbar, M.; Unwin, S.D. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 5p. (CONF-871101—52). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012112.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

An important element of any uncertainty analysis consists of evaluating the sensitivity of the output uncertainty distributions to the input assumptions. These sensitivity analyses require extensive information regarding mathematical correlations between input and output variables which are generally obtained through repeated computer runs of a physical model. However, in predicting uncertainties associated with severe accident sources terms using contemporary methods, techniques must be devised which reduce the need for extensive commutation using large computer codes. The purpose of the current paper is to propose a new method for sensitivity analysis which does not utilize response surface methods, but instead relies directly on the results obtained from the original computer code calculations. 3 refs., 1 fig.

49701 **(BNL-NUREG—39936) Observations on hydrogen generation in vicinity of the reactor cavity during the Direct Containment Heating scenario.** Ginsberg, T.; Tutu, N.K. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1987. Contract AC02-76CH00016. 6p. (CONF-871101—41). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012172.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

49702 **(BNL-NUREG—39956) Initial pipe break analyses for advanced LMR [liquid metal reactor] concepts using MINET.** Van Tuyle, G.J.; Chan, B.C.; Slovik, G.C. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). Jun 1987. Contract AC02-76CH00016. 9p. (CONF-871101—35). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012119.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

In support of an initial NRC review of DOE sponsored advanced liquid metal reactors (LMRs), BNL has performed some very conservative calculations of postulated primary loop pipe breaks using the MINET Code. This report briefly describes the results obtained from these calculations. 5 refs., 2 figs.

49703 **(BNL-NUREG—39958) Sensitivity of BWR [boiling-water reactor] shutdown margin tests to local reactivity anomalies.** Cokinos, D.M.; Carew, J.F. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). Jun 1987. Contract AC02-76CH00016. 7p. (CONF-871101—40). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012494.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The purpose of the work summarized in this paper has been to investigate and quantify the sensitivity of both the adjacent-rod and in-sequence Successful Shutdown Margin (SDM) tests to local reactivity anomalies. This was accomplished by introducing reactivity perturbations at selected four-bundle cell locations, and by evaluating their effect on core reactivity in each of the two tests.

49704 **(BNL-NUREG—39959) Calculation of MCPR [minimum critical power ratio] for BWR transients using the BNL plant analyzer.** Horak, W.C.; Diamond, D.J. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). Jun 1987. Contract AC02-76CH00016. 6p. (CONF-871101—36). NTIS, PC A02/MF A01; GPO Dep. File Number DE87012109.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The critical power ratio (CPR) is used for determining the thermal limits of boiling water reactors. In this study, critical power ratios for a series of transients run on the Brookhaven Plant Analyzer (BPA) [1] have been calculated. The transients include nominal base case simulations, simulations with variations in relief valve setpoints and the number of failed feedwater heaters, simulations at the 100% power, 75% flow point on the extended load line of the MEOD, and a simulation with partial feedwater heating. The plant represented with the BPA is a BWR/4 rated at 3293 MW

with a 6.38 m (251") vessel. Data were obtained by the Plant Analyzer Development Group at BNL from a variety of sources describing the Browns Ferry Plant.

49705 **(BNL-NUREG—40272) Protective action alternatives for accidents at nuclear power plants.** Tingle, A.; Pratt, W.T.; McGuire, S.A. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). Jun 1987. Contract AC02-76CH00016. 18p. (CONF-8706205—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014923.

From Conference on computer codes for the probabilistic assessment of accident consequences; Vienna, Austria (22 Jun 1987).

Protective action calculations have been performed for five different light water reactors (LWRs) and containment designs using high and low fission product releases for early and late containment failures for each plant. These fission product release estimates were obtained from studies performed for the recently published "Reactor Risk Reference Document" (NUREG-1150). Five protective actions were considered for the risks of exceeding various dose levels to the red marrow versus centerline distance from the plants using site-specific meteorology. The strategies considered were 4 hours of normal activity, basement sheltering, large building sheltering, evacuation at release, and evacuation 1 hour after release. The evacuations were computed using 10 mph evacuation speed for all sites. Additional calculations were performed for the dose contributions due to the cloud, ground, and inhalation pathways.

49706 **(CNEN-DR-GAA—01/85) Utilization of DRUFAN 01/MOD 02 computer code for the depressurization phase analysis of a postulated loss of coolant accident in Angra 2/3 Nuclear Power Plants.** Austregesilo Filho, H.; Figueiredo, P.J.M. (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro. Dept. de Reatores). Aug 1985. 47p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703379.

The DRUFAN 01/Mod 2 developed by Gesellschaft fur Reaktorsicherheit (GRS) mbh to simulate thermohydraulic behavior of the primary circuit of PWR reactors, during the despressurization phase and initial refilling phase of loss of coolant accidents by great ruptures, is presented. The program simulates the system to be analysed by control volumes-concentrated parameters model - and it is based on numerical solution of conservation equations for mass of water, mass of vapor, quantities of motion and energy, and on the control volume homogeneity hypothesis. The possibilities of thermodynamic disequilibrium, determining mass transfer between liquid and vapor phases assuming that one saturated phase, are considered. The process of computer code implantation in the Honeywell Bull 64 DPS 7 system at CNEN, the modifications done into the program and the application to the despressurization phase analysis of a loss of coolant accident at Angra-2 and Angra-3 reactors are considered. (M.C.K.).

49707 **(CNEN-DR-GAA—01/87) Considerations about source term now used aiming to emergency planning.** Austregesilo Filho, H. (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro). Jan 1987. 17p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703380.

The applicability of source terms, in parametric studies for improving external emergengy plan for Angra-I reactor is presented. The source term is defined as, the quantity and radioactive material disposable for releasing to the environment in case of austere accident in a nuclear power plant. The following hypothesis: occurring accident, 100% of the noble gases, 50% of halogens and 1% of solid fission products contained into the reactor core, are released immediately toward the containment building; the radioactivity releasing to the environment is done at a constant rate of 0.1% in mass per day; the actuation of mitigated systems of radioactivity releasing, such as, spray of container or system of air recirculation by filters, is not considered; and the releasing is done at soil level. (M.C.K.).

49708 **(CONF-871101—12) Source term experiment STEP-3 simulating a PWR severe station blackout.** Simms, R.; Baker, L. Jr.; Ritzman, R.L. (Argonne National Lab., IL (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 21 May 1987. Contract W-31109-ENG-38. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011376.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

For a severe PWR accident that leads to a loss of feedwater to the steam generators, such as might occur in a station blackout, fission product decay heating will cause a water boiloff. Without effective cooling of the core, steam will begin to oxidize the Zircaloy cladding. The noble gases and volatile fission products, such as Cs and I, that are major contributors to the radiological source term, will be released from the damaged fuel shortly after cladding failure. The accident environment when these volatile fission products escape was simulated in STEP-3 using four fuel elements from the Belgonucleaire BR3 reactor. The primary objective was to examine the releases in samples collected as close to the test zone as possible. In this paper, an analysis of the temperatures and hydrogen generation is compared with the measurements. The analysis is needed to estimate releases and characterize conditions at the source for studies of fission product transport.

49709 **(CONF-871101—16) First TREAT [Transient Reactor Test Facility] transient overpower tests on U-Pu-Zr fuel: M5 and M6.** Robinson, W.R.; Bauer, T.H.; Wright, A.E.; Rhodes, E.A.; Stanford, G.S.; Klickman, A.E. (Argonne National Lab., IL (USA)). 1987. Contract W-31109-ENG-38. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011373.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

Transient Reactor Test Facility (TREAT) tests M5 and M6 were the first transient overpower (TOP) tests of the margin to cladding breach and prefailure elongation of metallic U-Pu-Zr ternary fuel, the reference fuel of the Integral Fast Reactor concept. Similar tests on U-Fs fueled EBR-II driver pins were previously performed and reported [1,2]. Results from these earlier tests indicated a margin to failure of about 4 times nominal power and significant axial elongation prior to failure, a feature that was very pronounced at low burnups. While these two fuel types are similar in many respects, the ternary alloy exhibits a much more complex physical structure and is typically irradiated at much higher temperatures. Thus, a prime motivation for performing M5 and M6 was to compare the safety related fuel performance characteristics of U-Fs and U-Pu-Zr. This report described conditions, results, and conclusions of testing of these fuel types.

49710 **(CONF-871101—20) SASSYS analysis of EBR-II SHRT experiments.** Hill, D.J. (Argonne National Lab., IL (USA)). 1987. Contract W-31109-ENG-38. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011371.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

SASSYS is a general purpose one-dimensional thermal-hydraulic LMR systems analysis code. The application of SASSYS to studies of protected and unprotected transient analysis of LMR designs, such as PRISM and SAFR, is commonplace. This usage requires that a strong validation base exist for SASSYS. Validation of a code such as SASSYS is made up of a variety of activities such as, application of separate component models to model problems where the solution is analytically known, cross comparison with other codes and, most importantly, comparison with experiment. The EBR-II reactor is being used to perform experiments that address a wide range of LMR safety issues. The most important of these so far have been the SHRT series of experiments, begun in 1984, which culminated in the unprotected loss-of-flow and loss-of-heat sink transients performed as a demonstration to an international audience of fast reactor experts. The SASSYS-1 systems thermal hydraulic code for LMR's has been applied to the analysis of selected EBR-II SHRT experiments. The results show that SASSYS

can predict the transient thermal hydraulic and reactivity behavior of EBR-II under these conditions. This contributes to the validation of the modelling of EBR-II with SASSYS and of the code itself.

49711 **(CONF-871101—27) Calculation of absorbed doses to water pools in severe accident sequences.** Weber, C.F. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011944.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The liberation of radioactive materials into various containment locations during a severe accident creates a radiation field that may have a significant impact on the accident progression. High radiation may not only impair the functioning of important equipment, but contributes directly to a higher source term. Recent experiments indicate that radiation in air may create significant quantities of nitric acid. Irradiation of acidic iodide solutions is known to produce more volatile iodine species (chiefly I_2 and CH_3I). Hence, the high radiation fields in severe accidents could convert the less mobile iodide into more volatile forms, which could evaporate and present a considerable threat to public health and safety. The ORNL code TRENDS has been developed as a research tool to analyze the effects in severe accident sequences of such phenomena as gas phase iodine transport and radiolysis reactions. The purpose of this paper is to describe the methodology currently used for determining doses to sumps or water pools due to the decay of dissolved or suspended nuclides.

49712 **(CONF-8709104—3) The Chernobyl accident: Causes and consequences.** Malinauskas, A.P. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014786.

From ANS topical conference on population exposure from nuclear fuel cycle; Oak Ridge, TN, USA (15 Sep 1987).

Two explosions, one immediately following the other, in Unit 4 of the Chernobyl nuclear power station in the Soviet Union signaled the worst disaster ever to befall the commercial nuclear power production industry. This accident, which occurred at 1:24 a.m. on April 26, 1986, resulted from an almost incredible series of operational errors associated, ironically, with an attempt to enhance the capability of the reactor to safely accommodate station blackout accidents (i.e., accidents arising from a loss of station electrical power). Disruption of the core, due to a prompt criticality excursion, resulted in the destruction of the core vault and reactor building and the sudden dispersal of about 3% of the fuel from the core region into the environment. Lesser but significant releases of radioactivity continued through May 6, 1986, before attempts to certain the radioactivity and cool the remnants of the core were successful. The amount and composition of material released in the course of the accident remain somewhat uncertain, and inconsistencies in the release estimates are evident. The Soviet estimates, in addition to the dispersal of about 3% of the fuel, include complete release of the noble gas core inventory, 20% of the fission product iodine inventory, 15% of the tellurium inventory, and 10 to 13% of the fission product cesium inventory. The iodine and cesium release estimates are not consistent with the noble gas values, and are as much as a factor of two less than some estimates made by experts outside the Soviet Union.

49713 **(EGG-M—18587) The DOE Advanced Reactor Severe Accident Program (ARSAP): An overview.** Fontana, M.H.; Buhl, A.R.; Copp, R.D. (IT Corp., Oak Ridge, TN (USA); EG and G Idaho, Inc., Idaho Falls (USA)). 22 Jun 1987. Contract AC07-76ID01570. 7p. (CONF-870820—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014872.

From PSA 87: international topical meeting on probabilistic safety assessment and risk management; Zurich, Switzerland (31 Aug 1987).

The US Department of Energy has implemented the Advanced Reactor Severe Accident Program (ARSAP) to assure resolution of severe accident related issues and to support industry efforts to certify standardized advanced light water reactors. This paper provides an overview of the program. 1 ref.

49714 **(INIS-BR—783) Seismic analysis of nuclear power plant structures by Lanczos mode superposition method.** Coutinho, A.L.G.A.; Alves, J.L.D.; Landau, L.; Lima, E.C.P. de; Ebecken, N.F.F. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). 1986. 1p. (In Portuguese). (CONF-8610317—4-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703529.

From 4. Brazilian symposium on piping and pressure vessels; Salvador, BA, Brazil (28 Oct 1986).

Published in summary form only.

49715 **(INIS-BR—787) Calculation methods for analysing nuclear power plant accidents and its qualification.** Sacco, W. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 11p. (In Portuguese). (CONF-8605239—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703532.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

A methodology of transient and accident analyses able to carried out calculations for all transients and accidents required to support operation and operation licensing of Angra-1 reactor reload, is presented. (M.C.K.).

49716 **(INIS-BR—793) Probabilistic risk analysis of Angra-1 reactor.** Spivak, R.C.; Collussi, I.; Silva, M.C. da; Onusic Junior, J. (Companhia Energetica de Sao Paulo (Brazil)). 1986. 17p. (In Portuguese). (CONF-8605239—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703536.

From 8. seminar on production and transmission of electric power; Sao Paulo, Brazil (4 May 1986).

The first phase of probabilistic study for safety analysis and operational analysis of Angra-1 reactor is presented. The study objectives and uses are: to support decisions about safety problems; to identify operational and/or project failures; to amplify operator qualification tests to include accidents in addition to project base; to provide informations to be used in development and/or review of operation procedures in emergency, test and maintenance procedures; to obtain experience for data collection about abnormal accurences; utilization of study results for training operators; and training of evaluation and reliability techniques for the personnel of CNEN and FURNAS. (M.C.K.).

49717 **(INIS-mf—10940) Safety assessment at the DOEL nuclear power plant site.** Franchois, H.; Vuyst, P. de. (International Atomic Energy Agency, Vienna (Austria)). 1986. 14p. (CONF-8610335—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700028.

From Seminar on the Chernobyl accident and its impact; Mol, Belgium (7 Oct 1986).

The safety design features, the administrative obligations, the emergency situations and planning for the DOEL nuclear power plant site are presented. (A.F.).

49718 **(INIS-mf—10941) Survey of the meteorological conditions during the first two weeks following the Chernobyl accident.** Dycker, E. de. (Institut Royal Meteorologique de Belgique, Brussels). 1986. 9p. (CONF-8610335—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700029.

From Seminar on the Chernobyl accident and its impact; Mol, Belgium (7 Oct 1986).

Meteorological data related to the radioactivity transport over Europe during the fortnight following the Chernobyl accident are presented. (A.F.). 27 figs.

49719 **(INIS-mf—10942) Implication on future priorities in radiation protection.** Kirchmann, R. (International Atomic Energy Agency, Vienna (Austria)). 1986. 19p. (CONF-8610335—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700030.

From Seminar on the Chernobyl accident and its impact; Mol, Belgium (7 Oct 1986).

As a result of the consequences of the Chernobyl accident, the aspects of health effects from radiation as well as the protection

norms are reviewed. In particular the radioprotection of the workers and the population, the emergency planning and the information of the public at national and international levels are discussed. (A.F.). 15 refs.

49720 (INIS-mf—10943) Assessment of doses received by the Belgian population due to the Chernobyl releases. Govaerts, P.; Fieuw, G.; Deworm, J.P.; Zeevaert, Th. (International Atomic Energy Agency, Vienna (Austria)). 1986. 16p. (CONF-8610335—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700031.

From Seminar on the Chernobyl accident and its impact; Mol, Belgium (7 Oct 1986).

The consequences of the exposure during the first year and beyond the first year after the Chernobyl accident in terms of radiation effects on the Belgian population are discussed as well as some uncertainties in these evaluations. (A.F.). 10 refs.

49721 (INIS-mf—10944) Contamination levels observed on the Belgian territory subsequent to the Chernobyl accident. Cottens, E. (Institut d'Hygiene et d'Epidemiologie, Brussels (Belgium)). 1986. 29p. (CONF-8610335—6). NTIS (US Sales Only), PC A03/MF A01. File Number DE88700118.

From Seminar on the Chernobyl accident and its impact; Mol, Belgium (7 Oct 1986).

A summary of the data from different laboratories concerning the fallout on the Belgian territory following the Chernobyl emissions is presented. The evolution of the particulate air activity at ground level, the integrated fallout captured in water, the deposition on soil surface directly for different localities in Belgium are given. The grass contamination, the milk contamination from individual farms, the concentration levels on leafy vegetables, surface waters and water basins and the contamination of meat during the month of May are presented. (A.F.). 15 figs.; 5 tables.

49722 (INIS-mf—10945) Chernobyl-4 Reactor and the possible causes of the accident. Motte, F. (International Atomic Energy Agency, Vienna (Austria)). 1986. 80p. (CONF-8610335—5). NTIS (US Sales Only), PC A05/MF A01. File Number DE88700032.

From Seminar on the Chernobyl accident and its impact; Mol, Belgium (7 Oct 1986).

A description and information about the Chernobyl nuclear reactor is given. Some comparison elements between the RBMK reactor type and GCR, CANDU, SGHWR and Hanford N reactor types are presented. A scenario of the possible causes of the accident is discussed. (A.F.).

49723 (INIS-mf—10988) Progress summary of the Chernobyl accident. Lecture. Iddekinge, F.W. van. (International Atomic Energy Agency, Vienna (Austria)). 17 Nov 1986. 30p. (In English and Dutch). (CONF-8610314—1-Summ.). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703574.

From Chernobyl - environment and health aspects; Hague, Netherlands (30 Oct 1986).

Based on two IAEA documents (the report of the USSR State Committee on the Utilization of Atomic Energy named 'The accident at the Chernobyl nuclear power plant and its consequences' prepared for the IAEA Experts Meeting held in Vienna on 25-29 August, 1986 and the INSAG (International Nuclear Safety Advisory Group) summary report on the Post-accident review meeting on the Chernobyl accident, drawn up in Vienna from August 30 until September 5, 1986, this publication tries to present a logic relation between the special features of the RMBK-1000 LWGR, the cause of the accident, and the technical countermeasures. (Auth.). 1 figure; 2 tabs.

49724 (JAERI-M—86-178, pp 176-191) Development of several data bases related to reactor safety research including probabilistic safety assessment and incident analysis at JAERI. Kobayashi, Kensuke; Oikawa, Tetsukuni; Watanabe, Norio; Izumi, Fumio; Higuchi, Suminori. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

Presented are several databases developed at JAERI for reactor safety research including probabilistic safety assessment and incident analysis. First described are the recent developments of the databases such as 1) the component failure rate database, 2) the OECD/NEA/IRS information retrieval system, 3) the nuclear power plant database and so on. Then several issues are discussed referring mostly to the operation of the database (data input and transcoding) and to the retrieval and utilization of the information. Finally, emphasis is given to the increasing role which artifitial intelligence techniques such as natural language treatment and expert systems may play in improving the future capabilities of the databases.

49725 (NUREG/CR—4534) Analysis of diffusion flame tests. Shepherd, J.E. (Sandia National Labs., Albuquerque, NM (USA); Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). Aug 1987. Contract AC04-76DP00789. 87p. (SAND—86-0419). NTIS, PC A05/MF A01 - GPO. File Number DE87014984.

This report discusses the results and analysis of hydrogen diffusion flame tests conducted at the Nevada Test Site by EPRI and the US NRC. Those tests were designed to simulate the effects of hydrogen combustion inside a nuclear power plant containment following a degraded-core accident. Test initial conditions and sample data plots are given for 16 tests. Mixing and ignition phenomena are discussed in terms of the source parameters and igniter location. A simple model is developed for simulating the heat transfer and computing convective heat transfer coefficients from experimental pressure measurements. Convective heat transfer coefficients are reported for four tests. The effect of stagnation-point heat transfer is estimated. 24 refs., 21 figs.

49726 (NUREG/CR—4981) A safety assessment of the use of graphite in nuclear reactors licensed by the US NRC. Schweitzer, D.G.; Gurinsky, D.H.; Kaplan, E.; Sastre, C. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Sep 1987. Contract AC02-76CH00016. 39p. (BNL-NUREG—52092). NTIS, PC A03/MF A01 - GPO. File Number DE88000046.

This report reviews existing literature and knowledge on graphite burning and on stored energy accumulation and releases in order to assess what role, if any, a stored energy release can have in initiating or contributing to hypothetical graphite burning scenarios in research reactors. It also addresses the question of graphite ignition and self-sustained combustion in the event of a loss-of-coolant accident (LOCA). The conditions necessary to initiate and maintain graphite burning are summarized and discussed. From analyses of existing information it is concluded that only stored energy accumulations and releases below the burning temperature (650°C) are pertinent. After reviewing the existing knowledge on stored energy it is possible to show that stored energy releases do not occur spontaneously, and that the maximum stored energy that can be released from any reactor containing graphite is a very small fraction of the energy produced during the first few minutes of a burning incident. The conclusions from these analyses are that the potential to initiate or maintain a graphite burning incident is essentially independent of the stored energy in the graphite, and depends on other factors that are unique for these reactors, research reactors, and for Fort St. Vrain. In order to have self-sustained rapid graphite oxidation in any of these reactors, certain necessary conditions of geometry, temperature, oxygen supply, reaction product removal, and a favorable heat balance must be maintained. There is no new evidence associated with either the Windscale Accident or the Chernobyl Accident that indicates a credible potential for a

graphite burning accident in any of the reactors considered in this review.

49727 **(SAND—87-0819C) Statistically based uncertainty assessments in nuclear risk analysis.** Spencer, F.W.; Diegert, K.V.; Easterling, R.G. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 21p. (CONF-870898—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE87013724.

From Joint statistical meeting; San Francisco, CA, USA (16 Aug 1987).

Over the last decade, the problems of estimation and uncertainty assessment in probabilistics risk assessment (PRAs) have been addressed in a variety of NRC and industry-sponsored projects. These problems have received attention because of a recognition that major uncertainties in risk estimation exist, which can be reduced by collecting more and better data and other information, and because of a recognition that better methods for assessing these uncertainties are needed. In particular, a clear understanding of the nature and magnitude of various sources of uncertainty is needed to facilitate descision-making on possible plant changes and research options. Recent PRAs have employed methods of probability propagation, sometimes involving the use of Bayes Theorem, and intended to formalize the use of "engineering judgment" or "expert opinion." All sources, or feelings, of uncertainty are expressed probabilistically, so that uncertainty analysis becomes simply a matter of probability propagation. Alternatives to forcing a probabilistic framework at all stages of a PRA are a major concern in this paper, however.

49728 **(SAND—87-0943C) Aerosol growth in a nuclear reactor containment environment.** Gelbard, F. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 11p. (CONF-8709119—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013649.

From Workshop on water-cooled reactor aerosol code evaluation and uncertainty assessment; Brussels, Belgium (9 Sep 1987).

A new "moving-sectional" method for modeling aerosol growth during simultaneous steam condensation on aerosol particles and containment structures is presented. The method extends the sectional technique to provide for the first time: (1) simultaneous coupling of the containment atmosphere thermal-hydraulics to aerosol dynamics; (2) significant reduction of numerical diffusion and stiffness in the solution technique; and (3) incorporation of the solute and Kelvin effects. The method has been installed in CONTAIN and a calculation based on a TMLB' sequence at the Surry Nuclear Power Plant is presented. As a result of these advancements, one can now perform source term calculations that have been previously virtually impossible with existing approaches on an aerosol with an arbitrary number of components and arbitrary solubility characteristics.

49729 **(UCRL—52000-87-8) Energy and Technology Review, August 1987.** Lear, R.D.; O'Neal, E.M.; Crawford, R.B.; de Vore, L.; Hendry, D.P.; Kirvel, R.D.; Middleton, C.; Taft, S.O. (eds.). (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 41p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000351.

The contributions to this review are entitled "What happened at Chernobyl", "ARAC: Modeling an Ill Wind", "Assessment of Dose and Biological Effects from Chernobyl", "A New Assay for Human Somatic Mutations", and "Benzthiazoles in Estuarine Sediments as Indicators of Street Runoff". The first three articles deal with the events surrounding the Chernobyl accident, a model used to trace the spread of radioactive materials released in the Chernobyl accident, and techniques used to estimate quickly the effects of hemisphere wide fallout from Chernobyl. The next contribution describes an invivo assay which reliably measures accumulated genetic damage in humans, representing the integrated effect of exposure to environmental mutagens and carcinogens, including background radiation. The last article discusses a compound used in rubber tires which may serve as a tracer for contaminants washed into waterways from streets and highways.

25 ENERGY STORAGE

2506 Thermal

49730 (CONF-8511303—, pp 489-500) **New adsorption refrigerant combination of zeolite/water and its significance for refrigeration, air-conditioning and heating technology.** Maier-Laxhuber, P.; Kaubek, F. (KML Gesellschaft fuer Innovation, Forschung und Entwicklung, Muenchen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The authors discuss the utilization of the adsorption and desorption properties of zeolites while describing them and their adsorption properties. They compare the combination of zeolite/water with the liquid adsorption agent combinations used today, and present zeolite equipment with and without shut-off/isolating devices. (HAG).

49731 **(ORNL/Sub—86-27470/1) Heats of mixing for thermal energy storage systems: Phase 1, Selection of suitable liquid-liquid mixtures.** Stiel, L.I. (Polytechnic Univ., Brooklyn, NY (USA). Dept. of Chemical Engineering; Oak Ridge National Lab., TN (USA)). Jul 1987. Contract AC05-84OR21400. 51p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87014971.

A research program is being conducted on the use of liquid-liquid systems for thermal energy storage applications. The results of Phase I of this study, involving the identification of potential binary aqueous systems for further experimental study, are summarized in this report. Analytical procedures are described for the estimation of heats of mixing of liquid-liquid systems from phase equilibrium data. These procedures have been utilized to determine heat and cool storage capabilities of a number of mixtures. It have found that aqueous systems with lower critical solution temperatures in a suitable range can result in a large increase in the effective heat capacity in the critical region.

2509 Batteries

49732 **(ANL—87-33) Post-test analyses of aqueous batteries developed for electric propulsion: Summary report for January 1985-September 1986.** Miller, J.F.; Marr, J.J.; Smaga, J.A. (Argonne National Lab., IL (USA)). Jul 1987. Contract W-31109-ENG-38. 67p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000655.

This document is a summary of the activities conducted on post-test examination of aqueous electric-vehicle batteries from January 1985 to September 1986. The post-test analyses were conducted to determine the causes of performance degradation (e.g., capacity decline, power loss, self-discharge) in lead-acid and nickel/iron batteries. For the lead-acid batteries, the primary causes of capacity decline were generally found to be morphological changes in the positive active material, corrosion of the positive electrode grid, and loss of contact between the active material and grid in the positive electrode. For the nickel/iron batteries, the primary factors responsible for performance degradation were transport of iron through the separator to the nickel electrode and loss of contact between the active materials and current collector. These results have permitted more accurate assessments of current technical progress in development of aqueous electric-vehicle batteries and have helped to direct future R & D efforts.

49733 **(LBL—23495) Technology Base Research Project for electrochemical energy storage: Annual report for 1986.** Kinoshita, K. (ed.). (Lawrence Berkeley Lab., CA (USA)). Jul 1987. Contract AC03-76SF00098. 61p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000649.

The US DOE Office of Energy Storage and Distribution provides continuing support for an Energy Storage Program, which includes R & D on advanced electrochemical energy storage

and conversion systems. A major goal of this program is to develop electrochemical power sources suitable for application in electric vehicles and/or electric load-leveling devices. The program centers on advanced secondary batteries and fuel cells that offer the potential for high performance and low life-cycle costs. The Technology Base Research Project is divided into three major project elements: Exploratory Research, Applied Science Research, and Air Systems Research. Highlights of each project element are summarized according to the appropriate battery system or electrochemical research area. Cells covered include molten salt, lithium, alkaline, zinc/halogen, alkali/sulfur, nonaqueous, metal/air, fuel cell.

49734 **(SAND—87-0996C) A hydrogen/nickel oxide battery for remote applications.** Bush, D.M.; Sindorf, J.F. (Sandia National Labs., Albuquerque, NM (USA); Johnson Controls, Inc., Milwaukee, WI (USA)). 1987. Contract AC04-76DP00789. 10p. (CONF-871027—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87009048.

From 172. meeting of the Electrochemical Society; Honolulu, HI, USA (18 Oct 1987).

A hydrogen/nickel oxide battery is being developed for terrestrial applications. The main thrust has been to reduce the cost of the aerospace technology, with only minimal changes in the performance characteristics. The latest design consists of individual prismatic cells in a sealed common pressure vessel; thus, the battery is essentially maintenance free. The development work has been conducted at Comsat Laboratories and Johnson Controls, Inc., under a cost sharing contract with Sandia National Laboratories. Contract deliverables include cells and batteries. Testing of one of the batteries connected in parallel with a photovoltaic array and a constant current load is described. Only minimal controls are necessary since gases recombine internally on overcharge. The state-of-charge can be monitored continuously by measuring the hydrogen pressure.

49735 **Electrode-active material for electrochemical batteries and method of preparation.** Varma, R. (to Dept. of Energy, Washington, DC). US Patent 4,687,598. 18 Aug 1987. Filed date 17 Jun 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A method is described of preparing a battery electrode comprising providing an electrode-active material selected from chalogen-containing compounds of Ni, Fe, Pb, Co, Cu and mixtures thereof for a positive electrode and selected from the group consisting of Li, Na, K, Ca, Mg, Mn, Zn, Cd, Cu, Si, Al, Pb and alloys thereof for the negative electrode, mixing a ligand in the form of an electrically conductive polymer with the electrode-active material wherein the polymer is present in the range of from about 2% by weight to about 5% by weight of the electrode-active material, to provide metal ion or negative ion vacancies in the range of from about 0.05 to about 0.1 atom percent, the ligands for a positive electrode being selected from the class consisting of polyacetylene polymers having molecular weights in excess of 10,000 and cyclic polyamide with 3-5 functional groups. The ligands for a negative electrode are selected from the class consisting of tertiary butyl cyclohexyl-15-crown-5, TTF-TCNQ, and polymers of polyethylene oxide and one or more of LiCF/sub 3/SO/sub 3/, LiBr, Na/sub 2/S, and NaCN, mixing a binder with the electrode-active material and polymer, and forming the mixed electrode-active material and polymer and binder into a battery electrode.

49736 **Bipolar battery with array of sealed cells.** Kaun, T.D.; Smaga, J.A. (to Dept. of Energy, Washington, DC). US Patent 4,687,717. 18 Aug 1987. Filed date 8 Jul 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A bipolar battery is described comprising individual cells with electrode faces in a face-to-face stacked array with electrically opposite electrode ends and electrically conductive end face caps in contact with the electrode ends of the array, each cell including a pair of electrically opposite electrodes in contact with and separated by a central separator containing an electrolyte normally fluid during operation of the battery, the array including a current collector sheet between and in electrical contact with adjacent electrodes of adjacent cells, means for isolating each cell from adjacent cells including a pair of cup-like metallic electrode holders with perforated and facing closed ends in a spaced apart arrangement to enclose the electrodes of the cell with the perforations of each holder permitting an electrode-electrolyte interface for ionic transport, each holder having side walls forming an open end attached in a sealing engagement with an adjacent current collector sheet or end face cap, and an insulating member between and in sealing engagement with the adjacent perforated closed ends to enclose the electrolyte and perforations, and a housing enclosing the array with means for external electrical connection to the electrically opposite ends of the array.

49737 **Constant current, fast and float rate, variable hysteresis battery charger.** Steblay, B.J. (to Secretary of the Interior, Washington, DC). US Patent 4,686,443. 11 Aug 1987. Filed date 25 Jul 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A battery charging circuit is described connected to a voltage source and the terminals of a battery for maintaining a charge on the battery comprising: input means connected to the voltage source; current regulating means connected to the input means for providing a constant current output to the battery; resistive means connected to the regulating means for selectively setting charging rate currents provided to the battery by the regulating means; switching means connected to the resistive means for controlling the operation of the resistive means; means for sensing the state of charge of the battery connected across the terminals of the battery; and integrated buffer circuit means connected between sensing means and the switching means to control the operation of the switching means in response to the state of battery charge sensed by the sensing means.

49738 **Studies of high reliability long-life Li/SO/sub 2/ cells.** Jaeger, C.D.; Levy, S.C.; Thomas, E.V.; Cutchen, J.T. (Sandia National Labs., Albuquerque, NM, USA). *Journal of Power Sources;* **20**: No. 1/2, 27-35(May 1987). (CONF-8605129—).

From 3. international meeting on lithium batteries; Kyoto, Japan (27 May 1986).

To satisfy the need for a 5-year battery, a long-term test of Li/SO/sub 2/ cells was initiated. Premature failures were observed and a program was undertaken to identify the cause of these failures. Based on the results of this program, changes in the cell design were made which gave rise to the Sandia modified Li/SO/sub 2/ cell having improved long-life performance. Several batches of modified cells have been manufactured during the past five years. Acceptance testing of incoming cells from each batch revealed batch-to-batch variation in performance as well as a small proportion of cells with low capacity. A program to develop a non-destructive methodology for identifying cells with low inherent capacity was initiated. Several relevant non-destructive measurement parameters were identified. A decision tree screening technique, based on these parameters, was developed to identify those cells having low capacity.

49739 **Aluminum-air battery crystallizer.** Maimoni, A. New York, NY; American Institute of Chemical Engineers (1987). 24p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 7C.

A prototype crystallizer system for the aluminum-air battery operated reliably through simulated startup and shutdown cycles and met its design objectives. The crystallizer system allows for crystallization and removal of the aluminum hydroxide reaction product; it is required to allow steady-state and long-term operation of the aluminum-air battery. The system has to minimize volume and maintain low turbulence and shear to minimize secondary nucleation and energy consumption while enhancing agglomeration. A lamella crystallizer satisfies system constraints.

29 ENERGY PLANNING AND POLICY

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 49748

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 49273, 49388, 49495, 49749, 49750, 49751, 49782, 49783, 49785, 50227, 50233, 50865

49740 (CONF-871101—29) Probabilistic projection of nuclear and coal electric power generation costs. Williams, K.A.; Delene, J.G. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02. File Number DE87011641.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This paper presents the results of an analysis of future nuclear and coal-fired plant power generation costs in which the probability distributions of key variables are used with a Monte Carlo driver code to obtain power generation cost distributions for the options. The resulting distributions are compared to deterministic estimates based on recommended parameters given in the Department of Energy's Nuclear Energy Cost Data Base (NECDB). 4 refs., 1 fig., 1 tab.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 49257, 49258, 49287, 49288, 49364, 49373, 49374, 49378, 49381, 49383, 49384, 49388, 49416, 49461, 49462, 49463, 49464, 49711, 49814, 50074, 50224, 50226, 50227, 50230, 50242, 50254, 50255

49741 (ORNL—6405/R3) Environmental Regulatory Update Table, August 1987. Brown, K.J.; Langston, M.E.; Sharples, F.E.; Tucker, C.S. (Oak Ridge National Lab., TN (USA)). Sep 1987. Contract AC05-84OR21400. 102p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87014965.

The Environmental Regulatory Update Table provides information on regulatory initiatives of interest to DOE operations and contractor staff with environmental management responsibilities. The table is updated each month with information from the Federal Register and other sources, including direct contact with regulatory agencies. Each table entry provides a chronological record of the rulemaking process for that initiative with an abstract and a projection of further action.

2904 Natural Resources

REFER ALSO TO CITATION(S) 49297, 49482, 50233

49742 (PB—87-208427/XAB) Minerals yearbook, 1985. Volume 1. Metals and minerals. (Bureau of Mines, Washington, DC (USA)). 1987. 1080p. (BM-MYB—1985-VOL-1). NTIS, PC A99/MF E06.

See also PB—86-171162, and Volume 3, PB—87-208435.

This volume of the 1985 Minerals Yearbook, covering metals and minerals, contains 72 commodity or commodity group chapters with data on approximately 90 minerals that were obtained as a result of the mineral information gathering activities of the Bureau of Mines. In addition, the volume contains a chapter on mining and quarrying trends, a chapter discussing the statistical surveying methods used by the Bureau of Mines, and a statistical summary.

49743 (PB—87-209607/XAB) Availability of land for mineral exploration and development in south-central Alaska, 1985. Special pub. Bottge, R.G.; Northam, M.J. (Bureau of Mines, Juneau, AK (USA). Alaska Field Operations Center). 1986. 45p. (BM-SP—3-87). NTIS, PC A03/MF A01.

See also PB—87-196556; Library of Congress catalog card no. 86-600285; Portions of this document are not fully legible.

The Bureau of Mines investigated the availability of the land in south-central Alaska for exploration and mineral development of locatable minerals under State or Federal laws. The land ownership for an area of nearly 72.5 million acres in south-central Alaska was divided into 3 availability categories and 15 subcategories. In July 1985, 31.0 million acres of the study area were available for mineral exploration and development, 6.2 million acres were available with restrictions, and 35.3 million acres were unavailable. About 23.6 million acres in the study area are underlain by mineral terranes.

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 49374, 49751, 49752, 50865

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 49364, 49373, 49374, 49381, 49416, 49462, 49464, 49613, 50865

49744 (PAPO—87-101-MASTERINDEX) Nuclear Standards master index, January 1987-June 1987. (Oak Ridge National Lab., TN (USA). Performance Assurance Project Office). Jul 1987. Contract AC05-84OR21400. 55p. Performance Assurance Project Office-ORNL, Box Y, Oak Ridge, TN 37831. File Number TI88000621.

This index provides a complete list, organized by standard numbers, of all assigned NE numbers, their title, issue date, amendment number and date, issue date of the superseded standard if any, standards writer/cognizant engineer, DOE/cognizant engineer, and a remarks column which reflect the current status of the standard. The "Nuclear Energy Standards KWIC Index" of NE standards, also published by the Performance Assurance Project Office, should be consulted for information on standards when the assigned numbers are not known.

49745 (TVA/OP/PINFO—86/18) 1986 Power Program summary: Volume 1. (Tennessee Valley Authority, Chattanooga (USA). Office of Power). 1986. 55p. NTIS, PC A04/MF A01. File Number DE88900006.

This report, published in two volumes, provides a summary of TVA power and distributor operations in fiscal year 1986. Volume 1 data is based on the TVA fiscal year ending September 30, 1986, unless otherwise noted. Volume II data is based on the distributors' fiscal year ending June 30, 1986.

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 49807

2910 Conservation

REFER ALSO TO CITATION(S) 49782, 49783, 49784, 49785, 49787, 49788, 49790

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 49268, 49747, 49749

49746 (TVA/PUB—88/3) Load forecast and power supply summary prepared for fiscal year 1988. (Tennessee Valley Authority, Chattanooga (USA). Office of Power). Jul 1987. 132p. NTIS, PC A07/MF A01. File Number DE88900005.

The situation is basically the same as last year regarding TVA's long-term load forecast and power supply capability. If load growth is equivalent to TVA's high forecast, the earliest TVA would need base-load capacity beyond the construction of Bellefonte Nuclear Plant and capacity additions from our ongoing conservation and load management programs is 1999. This is two years later than the need date indicated in last year's power supply

review. However, peaking capacity is needed in 1997. Several supply options could delay the need for new conventional central station generating capacity. An increased emphasis on conservation and load management activities and the timely implementation of a major reliability improvement program for TVA's current coal-fired system would delay this need five to seven years. This report provides a load forecast summary (both short-term and long-term), load analysis, and a power supply summary. Major causal factors and forecast impacts are also discussed.

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 49288, 49364, 49383, 49384, 49461, 49462, 49463, 49464, 49741, 49750

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 49268, 49274, 49284, 49285, 49286, 49301

49747 (EPRI-P—5417) Proceedings: 1986 fuel supply seminar. Prast, W.G. (ed.). (Atlantis, Inc., Green's Farms, CT (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 273p. (CONF-8612107—). Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920002.

From Fuel supply seminar; San Diego, CA, USA (3 Dec 1986).

The sixth annual EPRI Fuel Supply Seminar was held in San Diego, California, from December 3 to 5, 1986. The theme was the impact of lower prices on utility decisions, encompassing heightened competition with electricity and among sources of generation, shifts in new capacity choices, and risks and developments in domestic gas supply and pricing. In addition, key considerations behind world oil and economic projections were discussed. A panel session on bulk power transfers explored emerging trends, case studies, and pivotal fuel considerations. Recent findings on impacts of acid rain legislation on coal markets were discussed. Presentations were made by EPRI research contractors on the results of ongoing research and by speakers from the utility, coal and natural gas industries, as well as independent consultants. The principal purpose of the seminar, as in past years, was to provide utility fuel planners and corporate planners with information and insights into the uncertainties in current fuel markets, and to aid utilities in pursuing flexible fuel strategies.

2960 Electric Power

REFER ALSO TO CITATION(S) 49268, 49638, 49747

49748 Transient and harmonic voltages associated with automated capacitor switching on distribution systems. Rizy, D.T.; Gunther, E.W.; Mc Granaghan, M.F. (Energy Div., Oak Ridge National Lab.). *IEEE Transactions on Power Systems;* **PWRS-2**: No. 3, 713-723(Aug 1987). Contract AC05-84OR21400.

One of the functions proposed for distribution automation systems is automated capacitor switching to control power factor and voltage profile on feeder circuits. This is one of the functions being implemented as part of the Athens Automation and Control Experiment on the Athens Utilities Board (AUB) in Athens, Tennessee. A concern with automated capacitor switching is the increase in harmonic and transient voltages due to different capacitor configurations on the distribution system. A study was performed to evaluate the impact of the automated capacitor switching on the AUB distribution system. The study has identified problem areas, methods for determining the problem areas, and possible solutions. The substation capacitor banks were found to be the dominant factor in both the transient and harmonic responses of the distribution system. The harmonic response of the system is dominated by the parallel inductance/capacitance of the circuit comprised of the substation capacitor and equivalent source reactance at the substation. The transient analyses indicated that when the substation capacitor is energized, magnified transient voltages can occur at switched-in feeder capacitors. An evaluation of the effect of automated capacitor switching is necessary to properly design the automated capacitor switching schemes and the required arrester protection for any harmonic and/or transient overvoltage contingency.

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 49746, 49783, 49784, 50196

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 49482, 49484, 49487

49749 Comparative energetics and economics of alternative pathways for fuel production. Bull, S.R. (Solar Fuels Research Div., Solar Energy Research Institute, Golden, CO 80401). pp 1183-1192 of Energy from biomass and waste X. Klass, D.L. Chicago, IL; Institute of Gas Technology (1987). (CONF-860405—).

From 10. annual symposium on energy from biomass and wastes; Washington, DC, USA (7 Apr 1986).

An alternative description of conventional fuels, biofuels, and future fuels is provided. The approach taken builds on the commonality of those fuels' origins and the relationship of those origins to their end use. The alternative pathways for fuel production are defined and represented in a logical, visual scheme. All the fuel pathways begin with the basic components of light (hupsilon), water (H/sub 2/O), and carbon dioxide (CO/sub 2/) and through a variety of processes, result in a utilizable fuel. The conventional fossil fuels, natural gas, petroleum, and coal, were formed by the synthesis of hupsilon, H/sub 2/O, and CO/sub 2/ into organic matter and the subsequent fossilization over millions of years into underground deposits of these fuels. Biofuels pathways are routes to fuels with the same starting point, but with the time frame for production of a few years or less. Detailed biofuels alternative pathways that integrate the production and conversion steps are defined. Future fuels pathways are direct routes to fuel in the sense that no living organism is required and only a synthetic system, such as a photoelectrochemical system, is used to produce fuels from the three basic components. The utility of the pathway approach for developing a perspective on the opportunities for fuels from biomass as well as future fuels is illustrated and can be applied with comparative mass and energy flows, economics, energy contributions, and production/conversion efficiencies.

49750 Regional efforts to promote biomass energy technologies. Badger, P.C. (Biomass Energy Program, Tennessee Valley Authority, Biomass Branch, Muscle Shoals, AL 35660). pp 1439-1448 of Energy from biomass and waste X. Klass, D.L. Chicago, IL; Institute of Gas Technology (1987). (CONF-860405—).

From 10. annual symposium on energy from biomass and wastes; Washington, DC, USA (7 Apr 1986).

The U.S. Department of Energy sponsors the Regional Biomass Energy Program to promote the development and application of biomass energy production and conversion technologies. Four geographical regions have been identified to participate in the program: the Northwest, Great Lakes, Northeast, and Southeast. Projects conducted under the program are specifically oriented toward resources, technologies, applications, and issues most significant to the particular region. Projects are usually conducted through the State governments or through private sector solicitations. Although relatively new, the program has been very successful and has gained strong private sector and State government support.

49751 The state of solar energy technology. Block, D.L. (Florida Solar Energy Center, Cape Canaveral, FL). pp 1-5 of Proceedings of the 2nd national conference on renewable energy technologies. San Juan, PR; Center for Energy and Environmental Research (1983). (CONF-8308231—).

From 1. Pan American conference on energy and 2nd national conference on renewable energy technologies; San Juan, Puerto Rico (1 Aug 1983).

This paper presents an assessment of the state of solar energy technology based upon the experiences of the Florida Solar Energy Center and upon the results of a U.S. Department of Energy (DOE) funded solar technology assessment project. Major program areas of the Florida Solar Center include photovoltaics, low energy building design, testing and certification of solar equipment, OTEC and education and training of solar practitioners. The Florida solar experience and STAP have been used to establish the following priorities for solar energy technology development: High Priority - Photovoltaics, Passive Heating and Cooling, Biomass; Intermediate Priority - Water and Space Heating, OTEC, Wind, Solar Thermal Central Receiving; Low Priority - Industrial Process Heat, Active Cooling by Thermal Processes. It is recommended that first and second priority programs must be continued, that solar research and development must include near-term technologies; and that governmental energy policies and support must be stable and consistent. The world's leaders must be convinced that energy research and development, particularly in solar energy, must continue and must be afforded parity in economic considerations.

49752 **Industrial Wood Energy Feasibility Studies.** Curtis, G.B. Jr.; Didocha, R.J.; McGowan, T.F. (Georgia Institute of Technology, Engineering Experiment Station, Atlanta, GA). pp 1-12 of Proceedings of the 2nd national conference on renewable energy technologies. San Juan, PR; Center for Energy and Environmental Research (1983). (CONF-8308231—).

From 1. Pan American conference on energy and 2nd national conference on renewable energy technologies; San Juan, Puerto Rico (1 Aug 1983).

The Industrial Wood Energy Feasibility Studies were one of five tasks performed under a U.S. Department of Energy grant to the State of Georgia. The project goal was to stimulate the use of wood energy in the industrial sector as a substitute for fossil fuels. The nonforest products sector was chosen due to its lack of experience in procuring and using wood fuels: The project took place from 1979 through 1981. It had five major tasks: 1. Industrial Wood Energy Feasibility Studies. 2. Wood Fired Boiler Demonstration Projects. 3. Wood Fuels Processing Studies and Research. 4. Wood Gasification Research. 5. Technology Transfer. This paper is a review of the first task on Industrial Wood Energy Feasibility Studies. Comprehensive reports on this, and the four other tasks are available from Georgia Tech's Engineering Exepriment Station Technology Applications Laboratory.

30 DIRECT ENERGY CONVERSION

3003 Thermoelectric Generators

49753 **Ir/PuO/sub 2/ compatibility: Transfer of impurities from plutonium dioxide to iridium metal during high temperature aging.** Taylor, D.H.; Christie, W.H.; Pavone, D. (E. I. du Pont de Nemours and Co., Savannah River Lab., Aiken, SC 29808). pp 201-224 of Optimizing materials for nuclear applications. Garner, F.A.; Gelles, D.S.; Wiffen, F.W. Warrendale, PA; The Metallurgical Society Inc. (1985). Contract AC09-76SR00001.

Plutonium oxide fuel pellets for powering radioisotopic thermoelectric generators for NASA space vehicles are encapsulated in iridium which has been grain-boundary-stabilized with thorium and aluminum. After aging for six months at 1310°C under vacuum, enhanced grain growth is observed in the near-surface grains of the iridium next to the PuO/sub 2/. Examination of the grain boundaries by AES and SIMS shows a depletion of thorium and aluminum. Iron, chromium, and nickel from the fuel were found to diffuse into the iridium along the grain boundaries. Enhanced grain growth appears to result from thorium depletion in the grain boundaries. However, in one instance grain growth was slowed by the formation of thorium oxide resulting from oxygen diffusion along the grain boundaries.

3005 Fuel Cells

REFER ALSO TO CITATION(S) 49733

49754 **(DOE/MC/22045—2364) Internal reforming development for solid oxide fuel cells: Final report.** Lee, A.L. (Institute of Gas Technology, Chicago, IL (USA)). Feb 1987. Contract AC21-85MC22045. 194p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE87006518.

Internal reforming of natural gas within a solid oxide fuel cell (SOFC) should simplify the overall system design and make the SOFC an attractive means for producing electrical power. This program was undertaken to investigate the catalytic properties of nickel cermets, which are prime candidates for SOFC anodes. The initial task in this program was an extensive literature search for information on steam reforming of light hydrocarbons. The second task was to modify and calibrate the reactor systems that were used in the experimental kinetic studies. Two systems were used in this investigation; a continuously stirred tank reactor system (CSTR) and a plug flow reactor system (PFR). In the third task, 16 nickel-zirconia cermets were prepared using four procedures, tape casting, Westinghouse slurry, incorporation of performers, and granulation. The catalytic behavior of three cermets was determined in the fourth task. The reaction was first order with respect to methane and -1.25 for steam. Ethane and propane in the feed did not affect the methane conversion rate. The cermet has a higher initial tolerance for sulfur than standard nickel reforming catalysts. The final task was a mechanistic study of the steam reforming reaction on nickel and nickel-zirconia catalysts. Results show that methane adsorbs on nickel catalysts dissociatively at 300 to 1000°C to form carbon and hydrogen atoms with the hydrogen atoms desorbing into the gas phase. The adsorbed carbon atoms can be gasified with hydrogen or steam to form CO, CO_2, or methane. 63 refs., 100 figs., 29 tabs.

49755 **(ETSU-N—104) Fuel cells: an update.** Lovering, D.G.; Lees, E.W. (Energy Technology Support Unit, Harwell (UK)). Jun 1987. 67p. NTIS (US Sales Only), PC A04/MF A01. File Number DE88750204.

A review is given of worldwide developments in fuel cell R and D since 1983. Recent technical progress, current problems, present industrial and commercial activities and the perceived range of applications for fuel cells are discussed. Seven types of fuel cell are reviewed and the prospects for UK involvement in fuel cell R and D are analyzed.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

49756 (NP—7770269, pp D1-D12) **Rational energy utilization.** Jun 1986. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87770269.

In Project-related experiences by Dornier System Company in the field of energy technology.

Various projects from the research field of 'rational energy utilization' and associated experience with application and operation are reported. These cover: rational energy utilization in coking; programme study 'On the road to new energy systems'; system study 'Energy sources for tomorrow'; the effects of technology and attitudes on energy consumption; optimization of cooling and refrigerating devices; development of an oxygen measurement probe for heating systems; issues of risk and acceptance in energy malsupply; possible methods for energy conservation in urban areas of developing countries with special reference to public mass transportation means and to buildings meeting climatic conditions; new roads to rational energy supply of rural districts with intensive forming exemplified by the Reichenau island in Lake Constance; ventilation in residential construction; open-space de-icing using geothermal tube systems; heat recovery with high-temperature heat exchangers. (HWJ).

3201 Buildings

REFER ALSO TO CITATION(S) 49797, 49799, 49800, 49801, 49805, 49806, 50014

49757 **(BNL—36225) Optimized ground coupled heat pump mechanical package.** Catan, M.A. (Brookhaven National Lab., Upton, NY (USA)). [1987]. Contract AC02-76CH00016;AC05-84OR21400. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014899.

This project addresses the question of how well a ground coupled heat pump system could perform with a heat pump which was designed specifically for such systems operating in a northern climate. Conventionally, systems are designed around water source heat pumps which are not designed for ground coupled heat pump application. The objective of the project is to minimize the life cycle cost for a ground coupled system given the freedom to design the heat pump and the ground coil in concert. In order to achieve this objective a number of modeling tools were developed which will likely be of interest in their own right.

49758 (CONF-8511303—, pp 239-253) **Requirements of heat pumps and air-conditioning systems on the water-side switching equipment.** Hincke, H. 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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The types of switching equipment and their properties have been known in conventional heating technology for a long time. The great number of misapplications, therefore, comes as a surprise. Completely different results were found for the very same switching device when evaluating its properties within a system. The author clarifies the characteristics and the behaviour of valves which depends from the K/sub vs/-values, the rangeability and the planned pressure percentage of the valve in terms of total pressure loss which is to be some 50%. The rangeability of the valve allows for a just about controllable minimum water volume flow through the system as a limit value which will require, for instance, speed-controlled pumps in the case of injection-type switching elements. However, the minimum water volume flow of the system is determined by another limit value: The minimum water volume flow through the heat exchanger (a condenser in this case). This indicates that a whole range of limit values determine the hydraulic conditions within a network. These problems may be solved by switching a storage facility in between the primary and the secondary circuits serving as 'hydraulic shunt', compensation of volumetric flow; limitation of heat pump switching times; heat storage and representative control section (danaide control).

49759 (CONF-8511303—, pp 445-459) **Hot-water heat pump is winning the day.** Jakobs, R.M. (Blomberg-Werke K.G., Ahlen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author presents the significance of the hot-water heat pump within the West-German market for electric hot-water heaters where it has gained a substantial market share and the acceptance of both industry and final consumer. A historical review shows the beginnings of the hot-water heat pump. Today's models represent the third generation in the line of technological development of these devices since 1980. They are characterized by very low operating cost and fully-fledged design. (HAG).

49760 (CONF-8511303—, pp 461-472) **Quattronic: A modern heating system featuring integrated heat pump.** Damrath, J. (Happel G.m.b.H. und Co., Herne, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The Quattronic system is a central heating installation for single-family and small two-family houses and comprises a microprocessor controlled combination of low-temperature boiler, heat pumps and storage tank. The individual conponents, heating operation and useful water preparation or their combination with the boiler and/or heat pump are presented. The paper concludes with a demonstration of the open-loop and closed-loop control of the heating system and of the functional principle of the process. (HAG).

49761 (CONF-8511303—, pp 613-626) **Direct digital control (DDC) systems and their application in HVAC technology.** Moehl, U. (Honeywell G.m.b.H., Maintal, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

Since the introduction of direct digital control (DDC) systems in HVAC technology and engineering which, at first, involved digital microprocessor-based controllers substituting analog controllers, DDC systems have shared in the racing development of electronics and have substantially altered their potential for applications thus suggesting to rethink their definition and application. The author demonstrates the structural development of HVAC systems, the principles of DDC system design and function, the requirements made on such systems and their implementation exemplified by a second-generation DDC system. The author presents an application in practice to provide insight into the practical potential and limits of DDC systems, and gives an outlook on development trends. (orig./HAG).

49762 (CONF-8511303—, pp 643-659) **Energy management systems - just a catchphrase.** Kurz, H. (HCS Technology G.m.b.H., Darmstadt, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author discusses management strategies for optimizing energy exploitation while including all technical installations operated in a building. He describes the transition from the central control computer to the energy management system (EMS) with distributed intelligence, presents the modular software as one pathway to universal energy management systems, and demonstrates a successful software structure exemplified by an existing EMS. (HAG).

49763 (CONF-8511303—, pp 661-679) **DDC technology and HVAC technology from an air-conditioning manufacturer's point of view.** Brickmann, U. (LTG Lufttechnische G.m.b.H., Stuttgart, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author discusses direct digital control (DDC) of air-conditioning systems, demonstrates digital control technology, the DDC system and its programming, analyses the operational management of the DDC system after its installation, and presents DDC systems for HVAC control and automation. (HAG).

49764 **(DOE/BP/11287—1) House Doctor Study: Final report: Hood River Conservation Project.** Engels, D.; French, S.; Schoch, K.; Block, S.; Peach, H.G. (Pacific Power and Light Co., Portland, OR (USA); USDOE Bonneville Power Administration, Portland, OR). Sep 1987. Contract AC79-83BP11287. 66p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87014960.

The focus of the House Doctor Study is evaluation of the house doctoring program as an addition to the super weatherization levels adopted as targets for the Hood River Conservation Project. The study does not address evaluation of house doctoring as a "stand alone" alternative weatherization program, nor does it address the theoretical potential of extensive house doctoring. Results of house doctoring were measured in terms of weather normalized kilowatt-hour savings in a comparison of the 1982-1983 and 1984-1985 winter seasons, before and after house doctoring and super weatherization. Results were also measured in terms of reduction in air changes per hour (ACH), which indicates how often outside air replaces air in the home; and in reducing effective leakage area (ELA), which is a summed representation of all household infiltration sites.

49765 **(DOE/BP/11287—5) Field weatherization logistics: Final report: Hood River Conservation Project.** Philips, M.; French, S.; Quinn, D.; Peach, H.G. (Pacific Power and Light Co., Portland, OR (USA); USDOE Bonneville Power Administration, Portland, OR). Sep 1987. Contract AC79-83BP11287. 146p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE88000011.

The Hood River Conservation Project (the Project) was funded by the Bonneville Power Administration (Bonneville) with two federal contracts. One contract, with Pacific Power and Light Company (Pacific) and the Hood River Electric Cooperative for $14 million, funded weatherization operations from May 1983 to January 1985. The other contract, with Pacific for $7 million, funds the Project's research and evaluation program from May 1983 to March 1989. This study describes the managerial logistics of retrofitting 2989 residences in the Hood River test area with super-weatherization measures during 30 months of contract time. The total performance cost of the weatherization contract was $14 million, with 87% of that cost, or $12.6 million, spent on retrofit measures and air-to-air heat exchangers (Philips et al., 1987). Approximately 14,000 super-weatherization measures were retrofit in 2989 test-site residences. The Project employed innovative technology to retrofit 530 mobile homes and install 1200 air-to-air heat exchangers.

49766 **(DOE/BP/11287—16) Electricity use and savings: Final report: Hood River Conservation Project.** Hirst, E.; Goeltz, R.; Trumble, D. (Pacific Power and Light Co., Portland, OR (USA); USDOE Bonneville Power Administration, Portland, OR). Apr 1987. Contract AC79-83BP11287. 72p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000010.

This report discusses methods and results related to actual electricity use and savings produced by the Project. Our approach first analyzes monthly billing data to produce estimates of weather-adjusted (normalized) annual electricity use. The weather-adjustment method used to convert raw electricity bills into useful estimates of annual electricity use is the Princeton Scorekeeping Method (PRISM). PRISM is applied to data from individual households and to aggregate data (all Project participants, and households in Hood River and the two comparison communities - Grants Pass and Pendleton, Oregon). These estimates of annual electricity use are then used as inputs to pooled time-series/cross-sectional models. These multivariate regression models explain variations in annual electricity use and savings across households and years. Models are developed for both program participants and households in the three communities. The primary purposes of these models are to identify the net (as well as total) electricity savings attributable to the Project and to quantify the effects of various factors (including participation in the Project) on electricity use and savings.

49767 **(DOE/CE/63479—T1) US Department of Energy grant program [on energy-related business ventures for weatherization assistance program subgrantees]: Final report.** (Oklahoma City Univ., OK (USA)). [1987]. Contract FG01-86CE63479. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000150.

The Oklahoma Department of Commerce (ODOC) received a Department of Energy grant to assist Weatherization Assistance Program Subgrantees (Community Action Agencies) develop for profit energy-related business ventures. ODOC has successfully administered all Federal grant funds in accordance with the terms and conditions specified in the grant agreement.

49768 **(DOE/CE/63499—T6) Energy-related business development plan: Final report.** (Warren County Community Services, Inc., Lebanon, OH (USA)). 30 Jun 1987. Contract FG01-86CE63499. 536p. NTIS, PC A23. File Number DE88000201.

Warren County Community Services, Inc. (WCCS) is an Ohio, non-profit corporation with over twenty years experience operating various human service programs and other projects. Planning efforts have been hampered by uncertainty and fluctuations in funding. To overcome these obstacles, the Board of Directors decided to explore several profit making or revenue producing activities. Three such business activities are explored in-depth within this study: energy conservation materials distribution wholesale and retail distribution centers, and housing rehabilitation corporation feasibility study.

49769 **(DOE/CE/63500—T1) Business plan, Orange-Chatham Home Repair, Inc.** (Joint Orange-Chatham Community Action Agency, Inc., Pittsboro, NC (USA)). 15 Sep 1987. Contract FG01-86CE63500. 41p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000151.

Orange Chatham Home Repair, Inc. (OCHR) is a service/construction business and is wholly owned by the Joint Orange-Chatham Community Action, Inc. (JOCCA), a non-profit corporation. The establishment of OCHR by JOCCA was the result of a program sponsored by the US Department of Energy, Weatherization Assistance Program, to explore options in serving the weatherization needs of low-income persons in the United States in particular, and Orange and Chatham Counties in general.

49770 **(EPRI-EM—5398) Residential heating, ventilating, and air conditioning research workshop: Final report.** Isaksen, L. (Analysis and Control of Energy Systems, Inc., Martinez, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 45p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920009.

The Residential HVAC load is an important one for electric utilities, contributing significantly to energy sales and peak demands. Utilities would like to see improvements in technologies which are desirable for both them and their customers. As a step in its R and D planning process, the Electric Power Research Institute (EPRI) conducted workshops to identify research needs in HVAC systems. The workshops covered all HVAC topics, but the emphasis was on heat pumps. This report summarizes the workshop on residential systems. The workshop on commercial systems is reported separately. The workshop brought together 35 experts representing builders, contractors, dealers, distributors, research organizations, manufacturers and electric utilities for one and one-half days of discussions. This report includes summaries of the opening remarks by eight attendees, research statements from each of three breakaway groups (components, systems and applications), and a summary of the research needs identified. The research topics presented define work that needs to be done. The topics will be used by EPRI for R and D planning, however, not all of the topics presented in the report are necessarily appropriate for EPRI sponsorship.

49771 **(LBL—23455) Development and implementation of survey techniques for assessing in-situ appliance efficiencies.** Sherman, M.H.; Szydlowski, R.F.; Cleary, P.G.; Modera, M.P.; Levine, M.D. (Lawrence Berkeley Lab., CA (USA)). May 1987. Contract AC03-76SF00098. 97p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000648.

A study was conducted to develop and field-test audit procedures for use in a large survey of in-situ appliance efficiency indicators. The appliances concerned were refrigerators, gas and electric water heaters, central air conditioners, and central gas furnaces. The efficiency indicators measured were compared to the manufacturer's rated values as determined by the California appliance standards procedures. The field test involved 61 homes during summer 1986 and winter 1986-1987. Appliances were submitted to

one-day short-term efficiency tests and one-week long-term monitoring of energy use and operational characteristics. Accuracy objectives were met for refrigerators, for the recovery efficiency of water heaters, and for central gas furnaces. The water heater standby loss and air conditioner efficiency audit procedures cannot be considered practical audit procedures to be included in a large survey of appliance efficiency. The audit procedures for a large survey would consist of one-day testing of the water heater, air conditioner, and furnace, and one-week monitoring of the refrigerator. Costs for the audit procedures recommended for the large survey are given. The audit procedures field-test produced the following appliance efficiencies results. Water heater recovery efficiencies were 7% lower than their rated values on average, while air conditioner efficiencies were more than 20% lower than their rated values on average. Refrigerator consumption was 12% higher than rated on average, and furnace efficiencies were within 1% of the rated values.

49772 **(NYSERDA—87-9) Energy conservation for New York City low-income housing: Final report.** Commoner, B.; Rodberg, L. (Queens Coll., Flushing, NY (USA). Center for the Biology of Natural Systems; New York State Energy Research and Development Authority, New York (USA)). Nov 1986. 141p. New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223. File Number TI87900986.

A new computer program, EA-QUIP, which is a model of the energy characteristics of typical low-income multi-family buildings in New York City, and of their response to different energy conservation measures, has been developed by modifying CIRA (a single-family building computer model developed by the Lawrence Berkeley Laboratory). Experiments were conducted that generally confirm the CIRA assumptions on air infiltration. The program computes the amount of energy saved, the payback period for each selected measure, and the internal rate of return on the investment (based on an assumed discount rate). Twenty New York City low-income multifamily residences were audited, and EA-QUIP was used to analyze the resulting data and to identify a package of cost-effective energy conservation measures. About half the selected measures have payback periods of less than two years. The most cost-effective measures are applicable to all or nearly all the tested buildings. Fuel records for 14 of the audited buildings were compared with fuel usage computed by EA-QUIP. A statistical analysis of the results shows that if EA-QUIP is applied to a population of buildings similar to those audited, there is a 95% probability that the average error in estimating fuel usage will be 1.9% +- 11.7%. The data from the EA-QUIP analysis of the audited buildings have also been employed to prepare an Action Guide that can be used without recourse to a computer, to estimate a package of the most cost-effective energy conservation measures for a given building.

49773 **(ORNL/CON—219) Energy and cost savings analysis of Wood Burning Boiler Plant, Fort Stewart, Georgia: Final report, Validation of ECIP Project No. 193: DOD, Energy Conservation Investment Program (ECIP).** Broders, M.A.; Miller, D.R. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 98p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87014974.

An Energy Conservation Investment Program (ECIP) project to install a 94,900 lb steam per hour wood burning boiler in the Fort Stewart Central Energy Plant was selected by the US Army for validation by the Oak Ridge National Laboratory. This ECIP project was justified on the basis of fuel cost savings and the use of a renewable energy source: wood waste, which is abundantly available at Fort Stewart, Georgia. This report documents the results of a 1-year postretrofit study designed to validate the energy and cost savings attributed to the installation of the new wood burning boiler. During the postretrofit validation study period (FY 1986), the new wood burning boiler produced approximately 90% of the steam required by the Central Energy Plant to meet the seasonal heating and cooling demands of Fort Stewart. In doing so, over 2,880,000 gal of No. 5 fuel oil (a nonrenewable energy source) was conserved. With full consideration given to the increase in electrical energy required to operate the new Wood Burning Boiler Plant addition, an annual nonrenewable energy savings of over 400,000 MBtu is projected. Based on the results of a life cycle cost analysis performed on this ECIP project, a first-year savings of over $1,200,000 is estimated. The resultant discounted savings ratio is 3.36, and the estimated simple payback period is 6.7 years. It was concluded that installation and operation of a wood burning boiler at a military installation such as Fort Stewart can result in significant cost and nonrenewable energy savings.

49774 **(ORNL/CON—228/P3) Field test evaluation of conservation retrofits of low-income, single-family buildings: Combined building shell and heating system retrofit audit.** McCold, L.N. (Oak Ridge National Lab., TN (USA)). May 1987. Contract AC05-84OR21400. 66p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87014973.

DOE asked ORNL to devise a procedure for selecting an optimum combination of building shell and heating system retrofits for single-family dwellings. To determine the best retrofits for each house that would maximize program savings, ORNL staff members developed an approach that used information from a preretrofit energy audit of candidate houses. Audit results are used to estimate annual energy savings for various retrofits for each house. Life-cycle benefits (B) are calculated, as are the estimated installation costs (C) for given retrofits in given houses. The benefits-to-cost ratios (B/Cs) are then ranked for all possible retrofits to all candidate houses, and the top-ranking B/C retrofits are selected for installation. This process maximizes program savings, and it is adaptable to varied housing types in different climates. The Audit-Directed Retrofit Program (ADRP) was field tested in a low-income housing retrofit program in Wisconsin during the winter of 1985-86. Results of the field test are reported in a companion document. This report describes the ADRP for the benefit of potential users.

49775 **(ORNL/CON—234) Use of wood for space heating: Analysis of Hood River Conservation project submetered homes.** Tonn, B.; White, D.L. (Oak Ridge National Lab., TN (USA)). Sep 1987. Contract AC05-84OR21400. 109p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87014975.

This report analyzes wood use in the 100 homes that had wood channel submeters installed as part of the Hood River Conservation project. In addition to wood heat output data, data were also available on electricity use, house characteristics, household demographics, and weatherization measures installed. The data indicate that in wood using homes, space heat produced by wood burning is approximately twice as much as provided by electricity. Woodusers tend to have larger homes and families, and use wood for strictly economic reasons. Patterns of wood and electricity use for space heating do not vary much by day of week, but are strongly correlated with outdoor temperatures. The large residential demand for wood may present difficult power planning problems for the Bonneville Power Administration if households suddenly switch back to electricity. However, conservation programs provide Bonneville benefits by dampening the magnitude of any potential swings.

49776 **(ORNL/Sub—85-27453/1) Ultraviolet radiation testing of roofing systems.** Amirkhanian, K.R.; Busching, H.W. (Clemson Univ., SC (USA). Dept. of Civil Engineering; Oak Ridge National Lab., TN (USA)). Jul 1987. Contract AC05-84OR21400. 112p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87014969.

The Roof Research Center (RRC), a DOE national user facility planned for construction at Oak Ridge National Laboratory, will be used for studying roof systems subjected to accelerated testing. A review of relevant literature concerning ultraviolet radiation (uv) and related testing and equipment was completed to determine the feasibility of using this proposed facility for artificially-induced ultraviolet weathering of twelve by twelve foot roof systems that will be tested for periods of up to eight weeks. Artificial weathering sources now in use for ultraviolet exposure include carbon-arc and xenon-arc lamps, ultraviolet lamps, and mirrors which concentrate natural solar radiation (EMMAQUA method). The shortest exposure period using these devices for which changes in tensile strength (-9% to +1%) and percent elongation (-29% to -3%) have been observed in roofing materials are: ultraviolet lanps - 2000 hours (≅83 days); carbon-arc - 2000 hours; xenon-arc - 2000 hours; EMMAQUA - 300,000 langleys (≅75 days exposure in Arizona).

An exposure period of only eight weeks is considered to be too short to degrade roof materials of interest with existing weathering sources. Separate ultraviolet exposure outside the Roof Research Canter would be required to evaluate uv sensitivity of the subject roof system. Aged (in-service) roofs could be tested at the Center to determine changes produced during weathering.

49777 **(PNL-SA—15011) Evaluation of resource leveraging retrofit partnerships: Methodology development.** Lee, A.D.; Callaway, J.W. (Pacific Northwest Lab., Richland, WA (USA)). May 1987. Contract AC06-76RL01830. 11p. (CONF-870811—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000088.

From Energy conservation program evaluation: practical methods and useful results; Chicago, IL, USA (19 Aug 1987).

A methodology has been developed to evaluate five state projects that demonstrate resource-leveraging partnerships for low-income residential retroïit. The US Department of Energy has provided seed money grants to the demonstration states to design and implement partnerships that use resource-leveraging. Evaluation of the projects started at the beginning of the projects and will continue through about the first 18 months. The study conditions and the nature of the projects do not lend themselves to application of any standard evaluation methodology. This paper describes the considerations that affected the development of the evaluation methodology being applied. The methodology relies principally on qualitative interview data to document what is being done in each project and to provide the basis for making inferences beyond the individual projects. The innovative nature of the projects was given special attention during methodology development. Though the study is still in progress, early indications are that the methodology has met the study needs well.

49778 **(PNL-SA—15089) A commercial building monitoring protocol: Implications for commercial sector program evaluation.** Mazzucchi, R.P. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1987. Contract AC06-76RL01830. 13p. (CONF-870811—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000082.

From Energy conservation program evaluation: practical methods and useful results; Chicago, IL, USA (19 Aug 1987).

A method to systematically measure and analyze the end-use energy consumption of commercial buildings is summarized. To facilitate analysis at various levels, detailed protocols for sample design, measurement plan development, and building characteristics data collections were developed for a large scale end-use measurement program. The analysis levels include examinations of building sectors, individual buildings, tenants, and building use zones. The key to this capability lies in hierarchical measurement methods and application of an organized taxonomy. Data for an example building are presented to illustrate the data and the standard reports which are generated. Implications of this monitoring protocol for energy conservation and load management program evaluations are discussed.

49779 **(TVA/OP/EDT—87/15) Modeling of heat transfer through fiberglass insulation to assess attic radiant barriers: Final report.** Roux, J.A.; Rish, J.W. III. (Tennessee Valley Authority, Chattanooga (USA). Div. of Energy Demonstrations and Technology; Mississippi Univ., University (USA). Dept. of Mechanical Engineering). Dec 1985. 215p. NTIS, PC A10/MF A01. File Number DE88900009.

Heat transfer results are presented for fibrous insulations (fiberglass) undergoing coupled transient conduction and radiation heat transfer under the influence of a temporally varying incident radiative flux and with temporally varying temperature boundaries. The heat transfer analysis was performed by solving the one-dimensional radiative transport equation for an absorbing, emitting, and scattering medium simultaneously with the one-dimensional energy equation. An iterative solution procedure was used in which the radiative transport equation was solved by the method of discrete ordinates, and where the energy equation was solved numerically with a control volume based finite difference scheme. The study was extended to include an analysis of the influence of reflective radiant barriers on the total heat transfer through the fiberglass by making appropriate adjustments to the radiative boundary conditions. Boundary conditions used in this analysis correspond to situations that would be typical of residential attics for a number of seasonal conditions.

49780 **(TVA/OP/EDT—87/16) Development of desiccant dehumidification system utilizing waste heat from air conditioners.** Lobo, M.; Russell, L.D. (Tennessee Valley Authority, Chattanooga (USA). Div. of Energy Demonstrations and Technology; Mississippi State Univ., Mississippi State (USA). Thermal and Fluid Dynamics Group). Jun 1987. 98p. NTIS, PC A05/MF A01. File Number DE88900010.

Humidity control in air conditioning can be the cause of a tremendous increase in cooling load. Very generally, the load in conditioning an enclosed space can be attributed to two sources: (1) the sensible cooling load, and (2) the latent cooling load. If the relative humidity in the room is far above the prescribed limit for comfort, the latent cooling load forms a substantial part of the total cooling load. This project seeks to reduce air conditioning loads by tackling the problem of dehumidification of the air in a unique manner. Rather than cool the air below the dew point, moisture is extracted from the air physically using a desiccant material (silica gel).

49781 **Potential of vegetation in reducing summer cooling loads in residential buildings.** Huang, Y.J.; Akbari, H.; Taha, H.; Rosenfeld, A.H. (Applied Sciences Division, Lawrence Berkeley Laboratory, Berkeley, CA 94720). *Journal of Applied Meteorology;* **26**: No. 9, 1103-1116(Sep 1987).

The potential of trees and other vegetation to reduce building cooling loads has been recorded in a number of studies, but the meso- and microclimate changes producing such savings are not well understood. This paper describes a preliminary attempt to model the effects of landscaping on temperature, humidity, windspeed and solar gain in urban climates using information from existing agricultural and meteorological studies, with particular attention placed on quantifying the effects of plant evapotranspiration. The climate model is then used in conjunction with the DOE-2.1C building simulation program to calculate the net reductions in air-conditioning requirements due to trees and other vegetation.

49782 **Innovative financing for energy conservation in buildings.** Lambert, F.S. (Office of State and Local Assistance Programs, U.S. Dept. of Energy, Washington, DC). pp 10.185-10.189 of Proceedings from the ACEEE summer study on energy efficiency in buildings. Washington, DC; American Council for an Energy Efficient Economy (1986). (CONF-860818—).

From American Council for an Energy Efficient Economy Santa Cruz summer study on energy-efficiency in buildings; Santa Cruz, CA, USA (17 Aug 1986).

The Department of Energy's (DOE's) state and local grant programs have accomplished a great deal. At current rates of federal funding, however, it will take many years to weatherize all low-income homes or reach all eligible schools and hospitals which need assistance. Due to the high priority being given to federal deficit reduction it is unlikely that federal funding will remain constant. DOE began several years ago to look at alternative ways to finance energy conservation activities. Among those alternatives were the variety of innovative financing arrangements that have begun to be offered in the private sector. The data show conclusively that there is no widespread use of the financing methods in the WAP and ICP client groups: 75% of WAP respondents and 73% of ICP respondents had never used any of them. Slightly over half of the utility respondents offer one or more of these financing methods to consumers. Utilities relay almost exclusively on direct loans or conservation incentives to encourage energy conservation. PUC respondents indicated that innovative financing programs are required of utilities in ten states. However, the data indicates a need for more communication among the states concerning these programs. DOE is reviewing these results in planning future initiatives to encourage use of innovative financing for conservation.

49783 **Dynamics of energy savings due to conservation programs.** Hirst, E.; Keating, K.M. (Oak Ridge National Lab.). pp 10.70-10.83 of Proceedings from the ACEEE summer study on energy efficiency in buildings. Washington, DC; American Council for an Energy Efficient Economy (1986). (CONF-860818—).

From American Council for an Energy Efficient Economy Santa Cruz summer study on energy-efficiency in buildings; Santa Cruz, CA, USA (17 Aug 1986).

Most analyses of utility and government conservation programs assume that program-induced energy savings are constant over time. This assumption, while convenient, is almost certainly incorrect. The dynamics of program energy savings have two aspects. The first involves changes in savings for households who participated in a particular year. Their total and net savings depend on changes in electricity prices, incomes, general awareness of energy issues, and other conservation programs. Natural gas data from participants and nonparticipants in home energy audit programs in California, Michigan and Minnesota show, for example, small increases in both net and total savings between the first and second postaudit years. Data from evaluations of financial incentive programs for residential retrofit in the Pacific Northwest, on the other hand, show increases in total electricity savings and declines in net savings between the first and second year after retrofit. The second aspect concerns changes in energy reductions over time for different cohorts of participants due to changes in the characteristics of participants, the conservation program itself, and the external environment.

49784 **Issues and results from the evaluation of the adoption and enforcement of model conservation standards.** Keating, K.M.; Lerman, D.I.; Mc Cutcheon, L. (Bonneville Power Administration, Portland, OR). pp 10.95-10.104 of Proceedings from the ACEEE summer study on energy efficiency in buildings. Washington, DC; American Council for an Energy Efficient Economy (1986). (CONF-860818—).

From American Council for an Energy Efficient Economy Santa Cruz summer study on energy-efficiency in buildings; Santa Cruz, CA, USA (17 Aug 1986).

The authors' implemented a multi-faceted evaluation of the adoption and enforcement of building codes and utility hook-up requirements in jurisdictions that adopted the Northwest Power Council's Model Conservation Standards. Evaluations of building energy codes present several problems that are not encountered in the evaluations of retrofit programs. In addition to a process evaluation of implementation of the codes, the author had to deal with the differences between enforcement, compliance, and energy impacts. This paper describes the evaluation of the implementation of building codes. It covers training, cost, procedures, and problems. Special research efforts were necessary to deal with evaluating compliance. Detailed inspections, blower door tests, and infrared video thermography tests were used. The effect of noncompliance on energy use was estimated based on "as built" conditions. Finally, the design of the impact evaluation based on billing records are discussed.

49785 **The ELCAP residential base study sample: A basic characterization.** Windell, P.A. (Bonneville Power Administration, Portland, OR). pp 10.170-10.181 of Proceedings from the ACEEE summer study on energy efficiency in buildings. Washington, DC; American Council for an Energy Efficient Economy (1986). (CONF-860818—).

From American Council for an Energy Efficient Economy Santa Cruz summer study on energy-efficiency in buildings; Santa Cruz, CA, USA (17 Aug 1986).

The End-use Load and Conservation Assessment Program (ELCAP) sponsored by the Bonneville Power Administration is among the first large scale fuel monitoring projects. This paper is a product of initial analytical work directed at assessing the results of the residential sampling and recruiting efforts, and is intended as an early contribution to the development of large scale monitoring protocols. Following a brief overview of the ELCAP and a summary description of the residential sample selection process, the paper then presents an initial characterization of the final residential Base Study sample. This paper concludes with an assessment of the relative success of the residential sample selection strategy in achieving the original objectives for the study.

3202 Transportation

49786 **(PB—87-208468/XAB) Traffic flow theory, characteristics, and highway capacity. Transportation research record.** Hall, F.L.; Gunter, M.A.; Krammes, R.A.; Crowley, K.W.; Rathi, A.K. (National Research Council, Washington, DC (USA). Transportation Research Board). 1986. 140p. (TRB/TRR—1091). NTIS, PC A07/MF A01.

Library of Congress catalog card no. 87-1536.

Contents include: further analysis of the flow-concentration; passenger car equivalents for trucks on level freeway segments; transitions in the speed-flow relationship; FREESIM: a microscopic simulation model of freeway lane closures; integrated modeling of freeway flow and application to microcomputers; statistical analysis of output ratios in traffic simulation; a model for predicting free-flow speeds based on probabilistic limiting velocity; comparative analysis of models for estimating delay for oversaturated conditions at fixed-time traffic signals; peaking characteristics of rural-road traffic; field validation of intersection capacity factors; analysis of the proposed use of delay-based levels of service at signalized intersections; saturation flows of exclusive double left-turn lanes; use and effectiveness of simple linear regression to estimate saturation flows at signalized intersections; freeway weaving section; a comparison of the 1985 highway capacity manual and the signal operations analysis package 84; entering headway at signalized intersections in a small metropolitan area; and traffic operation on busy two-lane rural roads in the netherlands.

49787 **(PB—87-212494/XAB) Road-transportation energy conservation: needs and options in developing countries.** (Hagler, Bailly and Co., Washington, DC (USA)). Sep 1986. 155p. (HBC/REF—86-178). NTIS, PC A08/MF A01.

The purpose of the report is to provide a reference manual to facilitate decision-making on specific conservation measures. The following tasks were carried out: Relevant statistics on transportation energy use in developing countries were gathered and analyzed; Developing countries were ranked according to their need for transportation energy conservation projects, and according to their potential for successfully implementing and benefiting from such projects; Relevant transportation energy-conservation projects in developing countries were identified, described, and evaluated; Measures that can be used to improve transportation energy efficiency were identified, categorized, and described; These measures were for their relevance to developing countries, their ease of implementation, and their ease of transfer -- from developed countries to developing countries and within developing countries evaluated; Potential impact of these measures in developing countries were quantified; Recommendations and conclusions for developing countries and international development organizations were provided; A detailed bibliography was developed to facilitate further research.

49788 **(PB—87-213070/XAB) Highway maintenance planning. Transportation research record.** Weatherell, R.M.; Ebrahim, A.A.N.; Fwa, T.F.; Sinha, K.C.; Feighan, K.J. (National Research Council, Washington, DC (USA). Transportation Research Board). 1986. 58p. (TRB/TRR—1102). NTIS, PC A04/MF A01.

Library of Congress catalog card no. 87-11309.

The 7 papers in the report deal with the following areas: choice of surface treatment: dependency on level of road improvement and maintenance; a study of the effects of routine pavement maintenance; estimation of service life and cost of routine maintenance activities; analysis of fuel consumption in routine maintenance of state highways in Indiana; energy savings from increased preventive maintenance on Indiana highways; pothole repair; you can't afford not to do it right; optimization of equipment use in routine highway maintenance.

49789 **(PB—87-214656/XAB) Status of the nation's local mass transportation: performance and conditions. Report to Congress, June 1987. Bienneal report.** (Urban Mass Transportation Administration, Washington, DC (USA)). Jun 1987. 227p. (UMTA-UBP—10-87-2). NTIS, PC A11/MF A01.

See also PB—85-217941.

The goal of the report is to provide factual information to assist the Congress in assessing the effectiveness and utility of the Federal assistance provided for mass transit. The report includes material on the role and structure of the mass transit industry; major demographic trends affecting the market for transit; how transit costs are being financed; the industry's performance as measured on the basis of efficiency, effectiveness, and cost-effectiveness; and issues in transit capital-investment decision making. The report also includes a section documenting service, both as an unsubsidized market competitor and as a contractor providing subsidized service more efficiently.

49790 **(PB—87-216966/XAB) Bus-inspection guidelines. Final report.** Giuliani, C. (National Research Council; Washington, DC (USA). Transportation Research Board). Jun 1987. 84p. (TRB/NCTRP/SYN—10). NTIS, PC A05/MF A01.

Library of Congress catalog card no. 86-51176. Report on National Cooperative Transit Research and Development Program, Synthesis of Transit Practice.

This synthesis will be useful to maintenance managers, general managers, and others concerned with preventive maintenance and inspection of buses. Information is presented on the features of preventive maintenance programs in use at selected transit agencies, and this information should be useful in evaluating current practices and alternative approaches. Preventive maintenance and inspection programs are the backbone of effective fleet maintenance. The report of the Transportation Research Board describes current criteria and procedures used by transit agencies and gives some general guidance that may be useful to agencies in revising or improving their preventive maintenance and inspection programs.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 49257, 49258, 49300, 49514, 49780, 50058, 50077, 50200

49791 **(ANL/CNSV-TM—188) Anaerobic treatment of industrial wastewaters.** Torpy, M.F. (comp.). (Argonne National Lab., IL (USA)). Aug 1987. Contract W-31109-ENG-38. 132p. (CONF-860965—). NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE88000654.

From 2. national conference on anaerobic treatment of industrial wastewaters; Chicago, IL, USA (11 Sep 1986).

Eight technical papers and nine poster papers are included. Individual papers were processed separately for the data base. (DLC)

49792 (CONF-8511303—, pp 135-154) **Dynamic behaviour of refrigerating circuits.** Upmeier, B.; Kruse, H. (Hannover Univ., Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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Energy optimization for stationary operation has acquired great significance in the development of refrigerating machines and heat pumps; hence, the study of their dynamic behaviour has grown in importance as well. Dynamic behaviour means the start-up or shut-down process which, in partial load control, are combined as cycle operation in electric drives or speed changes in internal combustion engines or electric inverter controls. Studies performed to date show cycle operation to produce a drop in the outputs as against stationary operation readings. This is caused by a variety of loss sources requiring enhanced energy application. In the light of the speedy development in electronics, efforts are made to have output control by cycle operation replaced by closed-loop control of the compressor drive speed as much as possible.

49793 (CONF-8511303—, pp 171-188) **System improvement by the application of electronic expansion valves.** Hartmann, K. (Carrier Barth und Stoecklein G.m.b.H., Muenchen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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The author discusses the improvement achieved in refrigerators by applying the electronically controlled expansion valve FLOTRONIC. Based on the theoretical principles of available expansion devices, the author comments on the improvement of the process by the application of the electronically controlled expansion valve while focussing on its application in refrigerating units and on the associated improvement of partial-load efficiency, smaller set-value deviations and enhanced reliability. In addition, he demonstrates a system simulation, its calculation and the results obtained with it. (HAG).

49794 (CONF-8511303—, pp 189-202) **Initial experience gained with CAD/CAM techniques exemplified by the development and manufacture of tubes for screw-type compressors.** Nowotny, S. (VEB Kombinat ILKA Luft- und Kaeltetechnik, Dresden, German Democratic Republic). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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Automation technology includes equipment, theories and procedures for control aiming at a purposeful automatic influencing of processes occurring in nature, society and industrial production. The application of automation techniques is exemplified by screw-type compressors while demonstrating the range of application of CAD/CAM techniques by means of the development and manufacture of screw-type rotors. The workstation for generating the software for the CAD/CAM technology is presented and general requirements made on CAD/CAM applications are discussed. (HAG).

49795 (CONF-8511303—, pp 255-268) **Cold-air curtain for shielding open commercial freezers.** Renz, U.; Schmitz, R.M. (Technische Hochschule Aachen, Germany, F.R. Lehrstuhl fuer Waermeuebertragung und Klimatechnik). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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These initial calculation results are to show that the heat and mass transfer processes in an open freezer can be predicted by computation and that they agree well with empirical findings. The calculation method will be checked against experimental results and be used for formulating recommendations for optimum operational and design parameters.

49796 (CONF-8511303—, pp 269-290) **Impact of suction vapour superheating on the performance of refrigerant compressors.** Stenzel, A. (Bitzer Kuehlmaschinenbau G.m.b.H. und Co. K.G., Sindelfingen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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The draft standards presented are to allow to compare the performance of different refrigerant compressors in terms of design and output. Open, semihermetic and hermetic compressors are used to illustrate this impact on performance, in particular that of suction vapour superheating which may be quite substantial for refrigerating performance and which depends from compressor design, size and refrigerant type used and can only be determined with suffi-

cient accuracy by way of comprehensive experimental studies. (HAG).

49797 (CONF-8511303—, pp 291-312) **Impact of suction pressure in networked refrigerating systems.** Gollnow, K. (Danfoss Handelsgesellschaft m.b.H., Offenbach, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The suction pressure level is important both for refrigerating performance and for the refrigerating performance number of the system. The paper discusses and evaluates the operational impacts of the suction pressure with special reference to possible fluctuations and their impacts on the refrigerant feed to the evaporator. It is recommended to replace two-point control of the cooling sites by modulating control matching the evaporator's output to respective cooling loads so that they will be in an equilibrium.

49798 (CONF-8511303—, pp 313-342) **Design and dimensioning of refrigerant-conducting pipelines.** Doering, R. (Fachhochschule Muenster, Burgsteinfurt, Germany, F.R. Fachbereich Versorgungstechnik). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The application of personal computers available at low cost these days allows to design and dimension pipelines of refrigerating systems both rapidly and easily. The author examines the impact of pressure drops in the refrigerant-conducting pipelines on the refrigeration process, establishes the most economic flow velocities, calculates the pressure drop and the dynamic viscosity of a refrigerant, analyses equations for the thermodynamic properties of refrigerants, studies oil feedback in the suction lines of a refrigerator and discusses the results of pipeline calculations when applying generalized equations exemplified by a refrigerant and correspondence parameters. (HAG).

49799 (CONF-8511303—, pp 343-355) **Improvement of the refrigerating performance number of air-cooled liquefier units.** Huelle, Z.R. (Huelle Energie-Engineering G.m.b.H., Hannover, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The traditional set-up of air-cooled liquefier units allows for improvement. The author shows a modified component set-up which allows to enhance the refrigerating performance number owing to more effective subcooling of the refrigerant. In addition, he describes today's state of the art of air-cooled liquefier units and makes a comprehensive calculational evaluation for various refrigerants to establish the influence of subcooling on the theoretical refrigerating performance number, and discusses their results. (HAG).

49800 (CONF-8511303—, pp 357-365) **Flooded evaporator for refrigerating systems using safety refrigerants and oil-lubricated compressors.** Lettner, J. (Fachhochschule Giessen-Friedberg, Giessen, Germany, F.R. Fachbereich Energie- und Waermetechnik). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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The author presents a flooded evaporator with no-loss oil feedback (patent pending) for cooling a liquid refrigerant. The same evaporator was studied, first, as a dry-type evaporator with thermostatic expansion valve feed and again after conversion to a flooded evaporator with floater control feed in the same refrigerating system; hence it was possible to graphically demonstrate the correlations between refrigerant temperatures, evaporation temperature and refrigerating performance for both modes of operation in terms of measurement results. The advantages of flooded operation and associated problems are discussed and solutions suggested. In conclusion, the author presents a flooded finned evaporator with no-loss oil feedback (patent pending) for cooling a gaseous refrigerant, e.g. moist air.

49801 (CONF-8511303—, pp 367-382) **Perspective for capacity control in refrigerators and freezers.** Kuijpers, L.; Jannssen, M.; Wit, J. de. (Philips Research Labs., Eindhoven, Netherlands). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

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Saving energy is economically very important in refrigerators and freezers in the light of their wide-spread domestic and commercial applications. The authors study different conservation measures under different aspects, explain the interactions between these conservation methods, present various methods for capacity control in freezers and refrigerators, analyse the stop/start losses and the cooling cycle, and discuss the results obtained from calculation based on the steady-state model for a two-stage closed-loop-control compressor system. (HAG).

49802 (CONF-8511303—, pp 383-407) **Rotary compressors for freezers and refrigerators.** Soerensen, G.; Gustafsson, V. (Danfoss A/S, Nordborg, Denmark). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

Now that the reciprocating compressor for generations has controlled the market of hermetic compressors for domestic systems, rotary compressors based on fixed vane principle are put on the market again. The present paper describes the compressor function, its characteristics and the special considerations you must take by the design of the system. It is characteristic for the rotary-compressor that it does not take up so much room in the refrigerating appliance, has a lower power consumption, demands a more exact dimension of the cooling circuit and the control system - and a very careful installation in the cabinet.

49803 (CONF-8511303—, pp 409-428) **Scroll compressor - a novel compressor for cryo-engineering.** Kaiser, H. (Bock G.m.b.H. und Co., Nuertingen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author describes the selection criteria, the state of the art of the reciprocating compressor technology and the prototype of the scroll compressor. Various compressor designs are contrasted based on measurements. The reciprocating compressor and its valve and drive optimizations are studied, and the scroll or spiral compressor and its functional principle are explained. (HAG).

49804 (CONF-8511303—, pp 429-444) **Geometry optimization of scroll compressors.** Bush, J.W.; Caillat, J.L.; Seibel, S.M. (Copeland Corp., Sidney, OH, USA). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The authors focus on geometry optimization and prognostication of the functional behaviour of differently sized scroll compressors. They present the scroll components, the scroll functional principle and the set-up of the simulation model, explain energy

flow models with associated assumptions, definitions and various equations, and discuss refrigerating performance and performance requirement relationships, supply and heating degrees and various losses, as well as the results of the calculation programme required for implementing optimization. (HAG).

49805 (CONF-8511303—, pp 473-488) **Evaporator in the absorption heat pump.** Muehlmann, H.P.; Wessing, W. (Ruhrgas A.G., Essen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The demonstration of the set-up of an absorption heat pump and its function explains the fact that, concerning the mixture of ammonia and water filling the heat pump, it is not pure ammonia which enters into the evaporator alone but that there are also small moieties of water being taken along. The description of the evaporation process makes it clear why the water moiety will reduce the evaporator performance which can be achieved theoretically. To study this problem, an examination programme was implemented aiming at establishing the cryotechnological process data based on various heating-technological operational data. The evaporator is studied for the influence of icing on heating performance. The total defrosting process including signal transmitting for defrosting start-up or shut-down is demonstrated.

49806 **(Technical memorandum—98) Dynamic analysis of a heat pump using established modelling techniques.** James, K.A.; James, R.W. (Polytechnic of the South Bank, London (UK)). Oct 1986. 31p. British Library Document Supply Centre, Boston Spa, Wetherby, West Yorks .

A thermodynamically based mathematical model giving the transient and steady state responses of a small vapour compression heat pump has been derived and used as a vehicle to analyse modelling techniques. General component models are required which can be flexibly linked to produce any system layout. These should be developed using Structured Analysis and Design Techniques so they are easier than available models to modify, maintain and correct.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 49762, 50200

49807 **(DOE/ID/12527—3-Vol.1) District heating development guide: Legal, institutional, and marketing issues: Volume 1.** Bloomquist, R.G.; Nimmons, J.T.; Rafferty, K. (Washington State Energy Office, Olympia (USA)). Jun 1987. Contract FG07-84ID12527. 259p. (WAOENG—87-17/1). NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE88000639.

District heating is a technology that if it is to be fully developed must overcome not only technical barriers but also regulatory, financing, and market entry barriers. District heating systems are extremely capital intensive making financing and initial market competitiveness extremely difficult. Overcoming these barriers is often made more difficult by state and local regulatory policy. Because technical issues have been covered in detail in the literature, Volume 1 of this guide to district heating provides only a brief summary of the most important technical considerations that a feasibility or design study must evaluate. This guide instead concentrates on nonhardware issues such as planning, financing, marketing, contracting, and regulation.

49808 **(PB—87-209466/XAB) Reactivation of granular carbon in an infrared traveling-belt furnace.** Nur, R.; Horvath, R.W. (Los Angeles County Sanitation Districts, Whittier, CA (USA)). Jul 1987. 66p. NTIS, PC A04/MF A01.

An all-electrical Shirco carbon regeneration furnace and its air pollution control system were evaluated for cost and process effectiveness in carbon reactivation at the Pomona Advanced Wastewater Treatment Research Facility. The granular activated carbon used for the Shirco Furnace evaluation study was exhausted in three 1.8 m (6 ft) diameter steel carbon adsorption columns connected in series. The columns treated unchlorinated and unfiltered activated sludge effluent from the 0.44 cu m/sec (10 MGD) Ponoma Water Reclamation Plant. The Shirco carbon regeneration system was found to be as effective as the multiple hearth and rotary-kiln furnaces in reactivating the exhausted granular activated carbon. The operation and maintenance cost for the Shirco furnace was, however, found to be higher than those for both the multiple hearth and the rotary-kiln furnaces.

49809 **Municipal waste processing apparatus.** Mayberry, J.L. (to Dept. of Energy). US Patent Application 6-003,523. 15 Jan 1987. 15p. Contract AC07-76ID01570. DE88000857 NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000857.

Municipal waste materials are processed by crushing the materials so that pieces of noncombustible material are smaller than a selected size and pieces of combustible material are larger than the selected size. The crushed materials are placed on a vibrating mesh screen conveyor belt having openings which pass the smaller, noncombustible pieces of material, but do not pass the larger, combustible pieces of material. Pieces of material which become lodged in the openings of the conveyor belt may be removed by cylindrical deraggers or pressurized air. The crushed materials may be fed onto the conveyor belt by a vibrating feed plate which shakes the materials so that they tend to lie flat.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 49283, 49815, 50000

49810 **(DOE/AL/33183—T4) Multidimensional modeling of convective heat transfer with application to I.C. engines: Technical progress report.** Jennings, M.J.; Morel, T. (Integral Technologies, Inc., Westmont, IL (USA)). 25 Sep 1986. Contract AC04-86AL33183. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014983.

The objective of this project has been to develop a more comprehensive understanding of the convective heat transfer process in complex, unsteady turbulent reacting flows, typical of those which occur in internal combustion engines. The specific area of research was representation of heat transfer in detailed multi-dimensional Navier-Stokes models, and modeling of turbulent transport mechanisms. The detailed tasks included a review of relevant prior work.

49811 **(DOE/ET/15397—T6-Vol.2) Program listing and test problems: Volume 2, [Appendix C, Magic code listing].** (Science Applications International Corp., San Diego, CA (USA)). Jul 1987. Contract AC04-79ET15397. 291p. NTIS, PC A13/MF A01; 1; GPO Dep. File Number DE87014454.

MAGIC (Modeling Algorithm for Generic Internal Combustion Engine) code listing of the MAGIC Cray version is included. All subroutines and functions are in alphabetical order. The main program is listed before all subroutines. The main program is the PARAMETER DECK and COMMON DECK where all global variables and arrays are defined.

49812 **(MIRA—87/03/XAB) Preliminary study of the controlled-acceleration smoke test using a dynamometer with inertia-selection capability but no power absorption.** Barron, C.R.; Dodd, A.E. (Motor Industry Research Association, Nuneaton (UK)). 1987. 85p. (MIRA/PR-K—3032/1-REV-1). NTIS PC$32.00.

There has long been a need for a simple test to evaluate the maximum exhaust-smoke emission of a diesel engine and to this end, the free-acceleration test was adopted. The unsatisfactory nature of the free-acceleration test has been recognized for some time but the ease with which it could be carried out tended to outweigh the

general lack of correlation with steady-state smoke levels. This report describes a preliminary program of work on eight vehicles to gain further information on the usefulness of the controlled acceleration and to investigate the possibility of using a relatively simple dynamometer to control the rate of acceleration.

49813 **(UCRL—97180) High pressure autoignition of natural gas/air mixtures and the problem of engine knock.** Westbrook, C.K.; Pitz, W.J. (Lawrence Livermore National Lab., CA (USA)). 3 Aug 1987. Contract W-7405-ENG-48. 4p. (CONF-871118—1). NTIS, PC A02. File Number DE87013799.

From Combustion Institute fall meeting; Honolulu, HI, USA (22 Nov 1987).

A detailed chemical kinetic reaction mechanism is used in a numerical model to examine the rate of autoignition in mixtures of natural gas and air under conditions which occur in internal combustion engines. The effects of variations in typical engine operating parameters on this autoignition rate are assessed, and the rate of ignition is related to the onset of engine knock. 29 refs.

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 49732, 49733

3307 Emission Control

REFER ALSO TO CITATION(S) 49287

49814 **(MIRA—87/01/XAB) In-service emissions of 204 vehicles manufactured between 1971 and 1982.** Williams, C.; Everett, M.T.; Dodd, A.E. (Motor Industry Research Association, Nuneaton (UK)). 1987. 56p. (MIRA/PR-K—32126). NTIS PC$32.00.

Two hundred and four cars from a number of sources were selected, using Society of Motor Manufacturers and Traders and Department of Transport Statistics, to be reasonably representative of the more-popular models manufactured between 1971 and 1982. Emissions results from the cold-start ECE cycle were compared with Type Approval levels appropriate to the individual cars. Standards weighted according to sample and sub-sample structures were calculated. As received, the average emissions from the 204 cars exceeded the weighted standards by 65, 41 and 4% for mass CO, idle CO and mass HC, respectively; average NOx emissions were only 43% of the weighted standard. The performances of individual approval groups varied somewhat, with compliance of the newer cars, approved to ECE 15.03, rather better than average and cars built before the introduction of emissions controls performing relatively well.

3308 Alternative Fuels

49815 **(PB—87-201950/XAB) Application of electronic fuel injection to the optimum engine for methanol utilization. Final report.** (Ricardo Consulting Engineers Ltd., Shoreham-by-Sea (UK)). May 1987. 323p. NTIS, PC A14/MF A01.

This report details the work engineers did in application of electronic sequential fuel injection to the optimum engine for methanol utilization. The program was based on a production 1.5-litre Volkswagen gasoline engine, the combustion system of which was converted to HRCC (high ration compact chamber) with a compression ratio of 13.1. The engine had been developed to run on methanol fuel using a carburetor and mechanically controlled ignition and ERG system prior to the program.

36 MATERIALS

REFER ALSO TO CITATION(S) 50404, 50717

49816 **(LBL—23852) An expert system for materials design.** Marinaro, D.E. (Lawrence Berkeley Lab., CA (USA)). May 1987. Contract AC03-76SF00098. 48p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000191.

As part of research to develop an expert system for materials design, an analysis of the knowledge and methods used by an expert was undertaken. The implications of this analysis led to the design and computer implementation of a unified, knowledge-based system consisting of a task-independent knowledge representation and a simple, but general, planning algorithm. The programs support the initial design formulation task of the evolutionary design approach: given an alloy system and a property that needs to be improved, the system will reason to a suggestion for improving the alloy. The particular example performed by the system is the addition of a micro-alloying element to improve the yield strength of an austenitic Fe-Ni based superalloy by increasing the lattice mismatch of the coherent hardening precipitate. 28 refs., 19 figs.

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 49271, 49279, 49279, 49360, 49361, 49540, 49540, 49544, 49544, 49561, 49566, 49566, 49574, 49629, 49649, 49649, 49650, 49650, 49937, 49952, 50026, 50028, 50029, 50046, 50066, 50072, 50073, 50507, 50755, 50776, 50779, 50788, 50793, 50934, 50935, 50936, 50981

49817 **(BDX—613-3710) Small-diameter wire tensile testing: Topical report.** Mizik, P.M. (Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.). Sep 1987. Contract AC04-76DP00613. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000835.

Tests were conducted on small-diameter wire (0.025 cm) per AMS 5834 to determine effects on yield and tensile strengths. Straight and coiled wire samples were heat-treated in vacuum, nitrogen, and hydrogen atmospheres to compare their effects on tensile properties. Surface flaws, strain rate sensitivity, and extensometer effects were also studied. Eight samples were included in scanning electron microscopy (SEM) fractography to document fracture mode variations. 13 figs., 2 tabs.

49818 **(CEA-CONF—8863) Study of the initial steps of oxygen and water vapor absorption on plutonium-gallium alloys by ESA and Auger spectrometry.** Courteix D.; Fontaine, J.M.; Lozes, G. (CEA, 75 - Paris (France). Direction des Applications Militaires). Oct 1986. 12p. (In French). (CONF-8610294—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752813.

From Seminar on surface analysis; Cadarache, France (14 Oct 1986).

Results are reported on initial steps of plutonium alloys (stabilized in phase δ by few percents of gallium) oxidation by oxygen and water vapor. Kinetics observed with oxygen for exposures up to 500 Langmuir are presented. Results are compared with those obtained previously on pure plutonium. First results concerning water vapor adsorption are also presented. They evidence a different initial oxidation and in particular hydroxyl radicals are present in the oxide formed.

49819 **(CNIC—00014) Development on thin wall tubes of dispersion type.** Zhang Shien; Wang Xiyou; Li Jianshan; Zhang Rongsheng; Xue Zhenshu. (China Nuclear Information Centre, Beijing, BJ). 1986. 11p. (In Chinese). (SINRE—0004). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703384.

A method using powder metallurgy and metallic extrusion to manufacture three kinds of magnesium based thin wall tubes of dispersion type is presented. In each case, the composition of dispersed gold, boron and hafnium in magnesium matrix is 0.5 wt%, 1 wt%, 2 wt%, 4 wt% and 8 wt% respectively. The diameter of the tubes are 20 mm with wall thickness of 1 mm. The process of mixing, compacting, lubricating, heat-extrusion, checking and die designing are described in detail. Measures for controlling tube tolerance and even distribution of dispersion phase, and improving the surface quality are suggested.

49820 **(CONF-870839—3) Characterization of fine-scale microstructures in aged primary coolant pipe steels.** Miller, M.K.; Bentley, J. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02. File Number DE88000340.

From 3. international symposium on environmental degradation of materials in nuclear power systems: water reactors; Traverse City, MI, USA (30 Aug 1987).

Atom probe field-ion microscopy, analytical electron microscopy, and optical microscopy have been used to investigate the changes that occur in the microstructure of cast CF 8 and CF 8M primary coolant pipe stainless steels after long-term aging. The cast duplex microstructure consisted of austenite with 15% δ-ferrite. Upon aging the ferrite spinodally decomposed into a fine scaled network of α and α'. A fine G-phase precipitate was also observed in the ferrite. The observed degradation in mechanical properties is probably a consequence of the spinodal decomposition in the ferrite. 7 refs., 14 figs., 4 tabs.

49821 **(CONF-870980—1) Modified 14Cr-16Ni stainless steels with improved creep resistance at 700°C due to tailored precipitate microstructures.** Maziasz, P.J.; Swindeman, R.W. (Oak Ridge National Lab., TN (USA)). Sep 1987. Contract AC05-84OR21400. 9p. NTIS, PC A02. File Number DE87014788.

From International conference on advances in material technology for fossil power plants; Chicago, IL, USA (1 Sep 1987).

The compositions of several 14Cr-16Ni (2.5Mo,2Mn) austenitic stainless steels were modified with combinations of minor and residual alloying elements to produce excellent creep strength based on unique precipitate microstructures. These modifications produce fine MC and FeTiP precipitate particles in the matrix for strength, and combinations of coarser $M_{23}C_6$, M_6C and MC, particles along the grain boundaries for improved ductility and rupture resistance. The creep-rupture resistance of these modified 14 to 16 steels is superior to that of type 316 or alloy 800H and better than that of 17 to 14CuMo at 700°C in the mill-annealed condition. These new steels approach the creep resistance of alloy 617 at 700 to 760°C. Analysis of microstructure and correlation with creep properties suggests that precipitate effects are primarily responsible for the improvement in mechanical properties. The design of the novel precipitate microstructures is based on microcompositional information obtained using state-of-the-art analytical electron microscopy (AEM). 7 refs., 8 figs., 1 tab.

49822 **(ECN—198) Structural investigations of some metallic glasses.** Sietsma, J. (Netherlands Energy Research Foundation, Petten; Technische Hogeschool Delft (Netherlands)). Mar 1987. 190p. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703404.

Metallic glasses were prepared by the melt spinning technique from iron and nickel alloys (Fe-Ni-P; Fe-B; Ni-Nb; Ni-B). Structure investigations were made by means of neutron diffraction experiments. Distribution functions and range orders were determined. (Auth.).

49823 (IAEA-TECDOC—409, pp 153-154) **Testing of structural materials in a research reactor.** Gillemot, F. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The tests on the steel and aluminium specimens irradiated in the research reactor WWR-S form the scientific background of the surveillance tests at the Paks nuclear power station and were utilized in constructing the Hungarian surveillance laboratory and training its staff.

49824 **(INIS-BR—697) Influence of surface treatment on the oxidation behavior of zirconium and Zircaloy-4.** Costa, I.; Ramanathan, L.V. (Associacao Brasileira de Corrosao, Rio de Janeiro). 1986. 5p. (In Portuguese). (CONF-8605288—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703457.

From 13. national seminar of corrosion; Rio de Janeiro, Brazil (12 May 1986).

The influence of fluoride concentration in surface treatment solutions on the oxidation behavior of Zr and Zircaloy-4 in the temperature range 350-760/sup 0/C have been studied by means of thermogravimetric analysis. Two solutions containing different concentrations of hydrofluoric acid have been used for surface treatments, following which surface roughness measurements were also carried out. The influence of fluoride ion concentration on oxidation behavior has been found to be significant at higher temperatures.

49825 **(INIS-BR—698) Fatigue corrosion of Zircaloy-4 in chloride solution.** Monnerat, C.S.S.; Sousa e Silva, A.S. de; Rocha, K.C.B.; Gomes, J.A.P. (Associacao Brasileira de Corrosao, Rio de Janeiro). 1986. 5p. (In Portuguese). (CONF-8605288—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703458.

From 13. national seminar of corrosion; Rio de Janeiro, Brazil (12 May 1986).

The fatigue bahaviour of Zircaloy-4 in a chloride solution was studied. It was concluded that Zircaloy-4 does not have its fatigue life decreased under cathodic potentials. Anodic potentials, however, influence markedly the life of the material. This influence is related to a specific range of potential and cyclic stress level. Two critical parameters were stablished: the yield stress and an electrode potential of 120 mV sub(ecs). The simultaneous assessement of these parameters produces a drastic reduction of material strength.

49826 **(INIS-BR—701) Mechanical strength and niobium and niobium-base alloys substructures.** Monteiro, W.A.; Andrade, A.H.P. de. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 18p. (In Portuguese). (CONF-8611184—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703692.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

Niobium and some of its alloys have been used in several fields of technological applications such as the aerospace, chemical and nuclear industries. This is due to its excellent mechanical strength at high temperatures and reasonable ductility at low temperatures. In this work, we review the main features of the relationship mechanical strength - substructure in niobium and its alloys, taking into account the presence of impurities, the influence of initial thermal and thermo - mechanical treatments as well as the irradiation by energetic particles.

49827 **(INIS-BR—702) Corrosion strength of niobium and it's alloys.** Alonso, N.; Takano, C. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 13p. (In Portuguese). (CONF-8611184—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703693.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

The main aspects of corrosion strength of the niobium and its alloys in acid and alkaline aqueous solution, in liquid metals and in oxidizing atmosphere are described. In some case the strength corrosion was compared to other materials. (M.J.C.).

49828 **(INIS-BR—711) Solute segregation and microstructural evolution in ion-irradiated vanadium-base alloys.** Loomis, B.A.; Kestel, B.J.; Gerber, S.B. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 13p. (CONF-8611184—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703698.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

The microstructural evolution in vanadium alloys and unalloyed vanadium determined from obsevations of specimens by transmission electron microscopy (TEM) is shown. The dependence of the solute concentration with the uses of several analyses technique is evaluated. (M.J.C.).

49829 **(INIS-BR—755) Marine corrosion program developed by NUCLEBRAS.** Moreira, P.A.P.; Quinan, M.A. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 3p. (In Portuguese). (CONF-861299—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703505.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

A marine corrosion program is being developed by NUCLEBRAS and NUCLEN. This program consists in carrying out non-accelerated experiments in marine atmosphere, with immersion in sewater and laboratory accelerated tests. The purpose is to obtain a correlation between the corrosion rates observed in non-accelerated conditions and laboratory tests. Through these results it is inteded, only with laboratory tests, to estimate the bahavior of similar materials when tsted in similar marine atmosphereic conditions. Some aspects observed in the implementation of the program and some results so far obtained are discussed.

49830 **(INIS-BR—756) Study of the influence of mechanical - thermal treatments on the creep behavior of a niobium stainless steel.** Rossi, J.L.; Ferreira, P.I. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 4p. (In Portuguese). (CONF-861299—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703506.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

The influence of microstructural parameters controlled by mechanical-thermal treatment chemical bond1chemical bond on the creep behavior of DIN-Werkstoff-Nr. 1.4981 stainless steel (material candidate for use as cladding of fast breeder reactor (fuel elements), is studied. The effects of the solution treatment, predeformation, predeformation puls aging and cycles of predeformation-ageing on the creep results obtained at 990 K, for apllied stresses in the range 70 MPc - 310 MPa, are discussed.

49831 **(INIS-BR—757) Mechanical behavior of a controlled rolled high-strength low alloy steeel plate, microalloyed with Nb e V.** Maria, C.R.; Bruno, J.C.; Gomes, D.T.; Chawla, K.K. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 4p. (In Portuguese). (CONF-861299—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703507.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

The tension and fatigue behaviour of a controlled rolled high-strength low-alloy steel plate, microalloyed with Nb and V, was studied. It was verified that the material showed an anisotropic tensile behaviour. In spite of this anisotropy, it was verified that the fatigue crack propagation rates (da/Dn) in the L, T and S directions showed similar results with respect to the two levels of mean applied stress.

49832 **(INIS-BR—758) Internal friction of Niobium alloys with zirconia precipitated.** Florencio, O.; Botta Filho, W.J.; Tejima, H.; Jordao, J.A.R. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 4p. (In Portuguese). (CONF-861299—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703508.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

Internal friction measurements have been carried out in Nb-Zr (— 0,1%-wt Zr) single crystals with different annealing and internal oxidation treatments. Relaxation peaks associated with the interactions of oxygen with the Nb matrix and the substitutional solute have been observed in the oxidated alloys and the oxygen contents in solid have been estimated according to the intensity y of the anelastic absorption peaks.

49833 **(INIS-BR—760) Microstructure of amorphous and crystalline zirconium alloys rapidly solidified.** Monteiro, W.A.; Bezerra, G.H. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 3p. (In Portuguese). (CONF-861299—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703700.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

In this work we report microstructural studies of rapidly solification of Zr-30% at Cu alloy. This composition was chosen because it is the Zr rich limit of glass formation range. The ribbons were prepared by melt spinning system (cooling rate is estimated in 10/sup 6/ K/s) and the average thickness of the microscopy were prepared by double jet electropolishing to investigate the microstructure of the ribbon. It was observed amorphos and crystalline regions. In the crystalline regions occured a radial growth morphology with stress contrats. The beginning of solidification is a polimorphous reaction and the shape of the micrograins is similar to spherulitic form. The average diameter of the grains are 0,5 μm or less.

49834 **(INIS-BR—761) Influence of heat treatments of the oxidation of Zircaloy-4 and Zr-2,5% Nb.** Costa, I.; Ramanathan, L.V. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 5p. (In Portuguese). (CONF-861299—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703510.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

This paper presents the influence of heat treatment on the oxidation behavior of Zircaloy-4 and Zr-2,5 Nb in oxygen, in the temperature range 350-700/sup 0/C, as determined by thermogravimetric analysis. It was found that alloys heat treated in the α-phase region had higher resistance to oxidation where as heat treatment in the β phase region resulted in higher oxidation.

49835 **(INIS-BR—784) Welded joint fatigue of a AISI 304 L type stainless steel.** Kuramoto, N.K.; Guimaraes, A.S.; Miranda, P.E.V. de; Pascual, R. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). 1986. 1p. (In Portuguese). (CONF-8610317—5-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703530.

From 4. Brazilian symposium on piping and pressure vessels; Salvador, BA, Brazil (28 Oct 1986).

Published in summary form only.

49836 **(INIS-BR—802) Mechanical properties of a microalloyed steel with high niobium content.** Kestenbach, H.-J.; Conceicao, I.N. da. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 8p. (In Portuguese). (CONF-8705176—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703545.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

A higher-than-usual niobium content is being considered as a possible alternative to heavy low-temperature controlled rolling which is usually required in order to develop high strength and toughness in microalloyed steel. In the present study, the effect of 0.24% Nb dissolved in austenite on the strength and toughness of polygonal ferrite has been investigated. The niobium addition reduced the ferrite grain size but at the same time led to the deterioration of impact properties without raising yield strength. Electron microscope observations suggested that the decrease in toughness was caused by intercrystalline fracture due to preferential carbonitride precipitation at austenite grain boundaries.

49837 **(INIS-BR—803) Hadfield steels with Nb and Ti carbides.** Vatavuk, J.; Goldenstein, H. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 10p. (In Portuguese). (CONF-8705176—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703706.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

The Hadfield Steels and the mechanisms responsible for its high strain hardening rate were reviewed. Addition of carbide forming alloying elements to the base compostion was discussed, using the matrix steel concept. Three experimental crusher jaws were cast, with Nb and Nb + Ti added to the usual Hadfield compostion, with enough excess carbon to allow the formation of MC carbides. Samples for metallographic analysis were prepared from both as cast and worn out castings. The carbic morphology was described. Partition of alloying elements was qualitatively studied, using Energy Dispersive Espectroscopy in SEM. The structure of the deformed layer near the worn surface was studied by optical metalography and microhardness measurements. The results showed that fatigue cracking is one of the wear mechanisms is operation in association with the ciclic work hardening of the surface of worn crusher jaws.

49838 **(INIS-BR—804) Sintered steels of high resistance alloyed to Nb, Mo, Mn and Si.** Klein, A.N.; Arroyo, I.K.; Salcedo, R.A. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 8p. (In Portuguese). (CONF-8705176—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703546.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

Sinterability, homogenization and mechanical properties of Nb-Mo-Mn-Si alloyed steels obtained by means of compaction and sintering at 1250/sup 0/C, are investigated on the basis of dilatometry, microstructural analysis, and tensile and hardness properties. The alloy components are combined on a single master alloy (in adequate proportions) wich presents only phases with easy dissolution in iron, resulting in improvement of the kinectics of sintering and homogenization processes. Optimal compositions show simultaneously an excelent dimensional stability during sintering and strength superior to 920 MPa and up to 1250 MPa when an additional heat treatment is made.

49839 **(INIS-BR—805) Mechanical properties of an acicular ferrite steel microalloyed to niobium and vanadium.** Palermo, M.R.; Bruno, J.C. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 9p. (In Portuguese). (CONF-8705176—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703547.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

Carbonitride precipitation hardening gas been studied in the acicular ferrite and bainite phases of a C-Mn-Nb-V steel. Precipitation hardening in the acicular ferrite phase was higher than in the bainite phase, although it was lower than expected. It was also observed that in both phases the fracture was ductile in as cooled samples but became partially brittle after the samples were aged for 150 minutes at 550/sup 0/C.

49840 **(INIS-BR—806) Partial substitution of vanadium by niobium in AISI H13 steel.** Itman Filho, A.; Balancin, O. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 7p. (In Portuguese). (CONF-8705176—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703548.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

The aim of this work was to study the tempering resistence in conditions of use of the AISI H13 steel, after partial substitution of vanadium by niobium. Four alloys of this steel were elaborated and in three of them the niobim was added in the contents of 0,2; 0,5 and 1,0%. Metallographic techniques were performed to compare qualitatively the niobium effect in several processing and thermal analysis of the steels. Grain size measurements were made after austenitization of the steels, hardness measurements in prepared samples were made after quenching and tempering, tensile testing at elevated temperature was investigated and yield strength, reduction of area after steel breaking and elongation were calculated. After these studies it was possible to certify that the partial substitution of vanadium by niobium did not alter significantly the basic mechanical properties of the AISI H13.

49841 **(INIS-BR—807) Influence of some parameters on the stress corrosion of a ABNT 304 stainless steel in MgCl/ sub 2/.** Candido, L.C.; Schroeder, R.M.; Mueller, I.L. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 7p. (In Portuguese). (CONF-8705176—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703707.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

The susceptibility to stress corrosion cracking of the austenitic stainless steel AISI 304 in MgCl/sub 2/ solution was studied. When changes on the surface film were produced like a prepassivation of the steel in HNO/sub 3/ solution or chromate solution or even a previous cathodic reduction. A mixture of MgCl/sub 2/ + NaCl was also used in such a way that the cation influence on the scc process could be analised. Results show that the surface film seems to have great importance in the see mechanism and that addition of Na/sup +/ ions inhibit cracks at the corrosion potencial.

49842 **(INIS-BR—808) Progress in the development of niobium alloyed high speed steel.** Guimaraes, J.R.C. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 8p. (In Portuguese). (CONF-8705176—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703549.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

The development of economy-grades of niobium alloyed high speed steel is described. Both the metallurgical concepts behind the steel design and the results of performance tests are presented.

49843 **(INIS-BR—811) Study of discordancy mobility in the AISI 304 steel.** Lima, L.F.C.P. de; Miranda, P.E.V. de; Monteiro, S.N. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 8p. (In Portuguese). (CONF-8705176—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703709.

From 2. meeting on technology and utilization of Brazilian steels; Rio de Janeiro, RJ, Brazil (18 May 1987).

Internal Friction (IF), measurements were carried out in a type AISI 304 austenitic stainless steels at approximately 1HZ of frequency in the temperature interval from 120 to 573K. The IF spectra and the vibration frequency were obtained in samples were submitted to specific heat treatments. The results showed IF spectra with a well defined peak at 260K. The intensity dependes on the amount of plastic deformation previously introduced in the sample. Another broad peak was detected between 300 and 400K. Both peaks could only be detected after plastic deformation in uniaxial tension or torsion. In torsionably deformed samples at liquid nitrogen temperature, 77 K, the IF spectrum is observed only after linear annealing at 400K. This apparently results from a high damping due to a possible phase transformation which occurs around room temperature. The broad peak at higher temperature is sensitive to recovery induced by linear annealings.

49844 **(INIS-mf—10694) Influence of impurities on the recovery of radiation defects in niobium.** Petzold, J. (Stuttgart Univ. (Germany, F.R.). Fakultaet 12 - Physik). 27 Mar 1986. 166p. (In German). NTIS (US Sales Only), PC A08/ MF A01. File Number DE87752881.

Pure niobium and doped niobium are irradiated with electrons (3 MeV) at a temperature of 7-8 K. During annealing the influence of the different impurities and of their doping concentration on the recovery of the electric conductivity are investigated. (BHO).

49845 **(INIS-mf—10961) Corrosion problems in power engineering. VI. conference.** (Skoda, Plzen (Czechoslovakia). Zavodni Pobocka Ceske Vedeckotechnicke Spolecnosti). 1986. 73p. (In Czech and Slovak). (CONF-8511301—). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558.

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The proceedings contain 29 papers of which 10 fall under the INIS Subject Scope. The papers deal with the corrosion effects and behavior of materials for the components and pipes of WWER type and sodium cooled fast reactors, and with the general questions of corrosion resistance of materials used in nuclear power plants. (Z.M.).

49846 (INIS-mf—10961, pp 14-21) **Effect of heat exchange media on mechanical properties of materials for fast reactor steam generators.** Bina, V.; Douda, J.; Kneifl, M.; Pech, R. (Statni Vyzkumny Ustav Materialu, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The material properties were studied in detail of samples removed from experimental reactor BOR-60 after 35,000 hours of operation in the sodium-water steam mixture in order to establish the effects of radiation, high temperatures and corrosion on materials used in fast reactor steam generators. Microstructure changes, fatigue properties and creep strength were investigated of materials of the 03Cr18Ni11, 05Cr21Ni32Ti0.5Al and 08Cr2.25Mo1NiNb types. The test results are shown in graphs and discussed in detail. They show that most problems arise with pitting corrosion in material 08Cr2.25Mo1NiNb which, at more exposure, will result in reducing the material fatigue resistance. (Z.M.).

49847 (INIS-mf—10961, pp 29-34) **Influence of chemical composition and grain size on rapid classification by EPR method of effects in long-term heat affected materials for fast reactor sodium circuits.** Eremias, B.; Fresl, M.; Faja, V. (Statni Vyzkumny Ustav Ochrany Materialu G.V. Akimova, Prague, Czechoslovakia; Vyzkumny Ustav Hutnictvi Zeleza, Dobra, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

Two groups of specimens of modified stainless steel types AISI 304 and 316, and of optimized stainless steel types AISI 304 and 316 of nuclear purity were investigated with respect to intergranular corrosion susceptibility. The effects of the chemical composition and of a different grain size in combination were studied on the susceptibility of the said materials to intergranular corrosion. Sample preparation and the experimental conditions are described in detail. The electrochemical potentiokinetic reactivation (EPR) method was tested for feasibility in rapid detection of long-term thermal effects on the melts of materials for fast reactor sodium circuits. The results are tabulated and are discussed in detail. It was shown that the EPR method can be used for both groups of steels AISI 304 and 316, i.e., also for corrosion resistant nuclear purity steels. The procedure used also tested the possibility of indicating the minimum effective chromium content necessary for providing immunity to thermal influencing of the melt. It showed that it was possible to determine this chromium content in the materials under study. (Z.M.).

49848 (INIS-mf—10961, pp 35-41) **Effect of annealing steel 18%Cr10%NiTi at temperatures between 550 and 850 degC on character of corrosion damage in oxidation media.** Hubackova, J.; Mazanec, K.; Cihal, V. (Vysoka Skola Banska, Ostrava, Czechoslovakia; Statni Vyzkumny Ustav Ochrany Materialu G.V. Akimova, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The effect was studied of annealing on the nature of corrosion damage of austenitic stainless steel type 08Cr18Ni10Ti in an oxidation medium with the aim of clarifying the views on precipitation processes taking place within the tempeature range 550 to 850 degC. It was found that a time interval exists for each temperature in the said range when corrosion rate in boiling 65% HNO/sub 3/ increases, which is associated with intergranular corrosion damage. It was shown that intergranular corrosion of nonsusceptibilized specimens was initiated by the dissolution of TiC discontinuously extracted on grain boundaries. The application of three-stage annealing in a temperature range of 680 to 800 degC significantly reduced the corrosion rate when compared to the effect of single-stage annealing under comparable conditions. The combination of temperatures used obviously affected both the precipitation kinetics and the chemism of the precipitating phases. (Z.M.).

49849 (INIS-mf--10961, pp 42-48) **Use of reactivation technique to assess intergranular corrosion in steel 03Cr18Ni12Mo3.** Barta, J.; Mazanec, K. (VUSM, Vitkovice, Czechoslovakia; Vysoka Skola Banska, Ostrava, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The reactivation technique was used for assessing susceptibility of steel 03Cr18Ni12Mo3 to intergranular corrosion. The technique uses the principle of passive state reactivation in dependence on the chromium content in the solid solution. It shows resistance or susceptibility to intergranular corrosion from differences between the chromium-depleted range and that where the chromium content was not reduced. Data were cumulated on increasing susceptibility of the steel to intergranular corrosion with increased annealing time at a temperature of 650 degC in an interval of 3 to 500 hours. It was also found that the use of the reactivation technique can sensitively indicate the initial stage of development of susceptibility to intergranular corrosion which is not yet manifest during testing in a standard solution. (Z.M.).

49850 (INIS-mf—10961, pp 49-55) **Effect of surface treatment on corrosion resistance of corrosion resistant steels.** Bystriansky, J.; Gottwald, M.; Mayer, J.; Zavodny, S. (Vyzkumny Ustav Hutnictvi Zeleza, Dobra, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The effect was studied of surface treatment of austenitic steels of the CrNiMo type on their corrosion resistance. The chemical processing of the surface modelling pickling, decontamination processes and electrochemical polishing proceeded in laboratory conditions. Corrosion testing proceeded using common techniques. An adverse effect was found of C, S, Mn, Ti, and N on the resistance of stabilized steels to point corrosion following chemical treatment of the steels. It was also found that the chemical treatment of the surfaces of stabilized steels should be performed with respect to the possible different course of surface formation because the resulting corrosion resistance not only depended on the chemical state produced but also on the physical state of the surface, such as the presence of microcracks, and on the cumulation of phases accelerating the cathode reaction rate. (Z.M.).

49851 (INIS-mf—10961, pp 56-62) **Participation of bacteria in corrosion damage of austenitic steels.** Bystriansky, J.; Fridrichova, D.; Prnka, T.; Mares, V. (Vyzkumny Ustav Hutnictvi Zeleza, Dobra, Czechoslovakia; Okresni Hygienicko-Epidemiologicka Stanice, Frydek-Mistek, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The results are summed up of experiments devoted to testing the technique and the selection of microorganisms and of the medium for studying the effect of microorganisms on the corrosion of austenitic materials. The experimental results show that the technique described is satisfactory. In the bacterial media of strains Thiobacillus, Ferrobacillus and Gallionella in the presence of Cl/ sup -/ ions, point corrosion damage of austenitic materials can be expected. Generally, corrosion damage can be expected in media with reduced pH and the simultaneous presence of chloride ions, and in solutions with increased oxidation-reduction potential. (Z.M.).

49852 (INIS-mf—10961, pp 95-102) **Effect of physicochemical parameters of medium on corrosion of low-pressure turbine part.** Horsky, J. (Skoda, Plzen, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The travel of steam from slightly overheated to moist steam of a moisture content lower than 20% is a characteristic feature of the low-pressure part of turbines. Problems are briefly discussed associated with material degradation in such an environment as a result of corrosion and corrosion-erosion processes. They may be eliminated by the development of materials showing high-grade mechanical properties and low susceptibility to corrosion damage, and by the achievement of high steam purity. (Z.M.).

49853 (INIS-mf—10961, pp 152-160) **Methods of assessing corrosion processes in power-generating facility.** Turyna, R. (Vyzkumny Ustav Energeticky, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703558. (CONF-8511301—).

From 6. conference on corrosion problems in power engineering; Zelezna Ruda, Czechoslovakia (5 Nov 1985).

The application of austenitic material especially susceptible to local corrosion and corrosion cracking, in both circuits of WWER nuclear power plants necessitated the investigation of the effects of possible electrolyte changes on the individual parameters of local corrosion. The methods are described of assessing the properties of oxide layers and deposits, such as the determination of the weight of an area unit of the oxide layer, the determination of porosity of layers and deposits, their mechanical strength, thickness and properties characterizing heat transfer in the layers. Attention is also paid to the physical and chemical properties of oxide layers and deposits, to their crystal structure, and to the determination of their chemical properties. It is shown that only a set of methods offering a complex picture of the whole problem area should be used in determining all properties. Results thus obtained can be used in the study of corrosion processes in the water-steam environment in nuclear power plants. (Z.M.).

49854 (INIS-mf—10998, pp 12) **Spin reorientation in Tm/sub 2/ Fe/sub 14/ B.** Day, R.K.; Dunlop, J.B.; Davis, R.L. (Commonwealth Scientific and Industrial Research Organization, Lucas Heights, Australia; Australian Inst. of Nuclear Science and Engineering, Lucas Heights). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

49855 **(SAND—87-0797) The effect of organic inhibitors on the atmospheric corrosion and solderability of copper.** Poulter, G.A.; Sorensen, N.R. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1987. Contract AC04-76DP00789. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000261.

We found preliminary atmospheric exposure and solderability tests on uninhibited copper and copper inhibited with benzotriazole and tolyltriazole. Exposures were performed in humidity chambers at high relative humidity (RH), at 40° and 70°C. Inhibitors applied from both a methanol-based and a water-based solution effectively reduced oxidation. Oxidation was reduced by 35% after 70 days exposure to 70°C, 65% RH, and reduced by 80% after 67 days exposure to 40°C, 100% RH. We determined solderability of inhibited and uninhibited copper with a Hollis meniscometer, and a meniscograph. Inhibited copper exhibited enhanced equilibrium solder parameters, but solder kinetics were degraded. 4 refs., 12 figs.

49856 **(UCRL—96764) Temperature hysteresis and magnetic transitions in amorphous Fe-Ni-Zr alloys.** Violet, C.E.; Borg, R.J.; May, L.; Rao, K.V.; Nogues, J.; Taylor, R.D.; Batra, A.P. (Lawrence Livermore National Lab., CA (USA); Royal Inst. of Tech., Stockholm (Sweden); Los Alamos National Lab., NM (USA); Howard Univ., Washington, DC (USA)). Sep 1987. Contract W-7405-ENG-48;W-7405-ENG-36. 11p. (CONF-871126—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000228.

From 32. conference on magnetism and magnetic materials; Chicago, IL, USA (9 Nov 1987).

Amorphous Fe/sub 89.3/Ni/sub 0.3/Zr_{10} and $Fe_{70}Ni_{20}Zr_{10}$ alloys in the "as-cast" and irradiated states have been studied with ^{57}Fe Moessbauer spectroscopy, as well as ac and dc susceptibility. Samples were irradiated with 14-MeV neutrons at room temperature to fluences in excess of 10^{17} n/cm^2 ($\cong 3 \times 10^{-4}$ dpa). The effects of the neutron irradiation on the magnetic properties of the Fe/sub 89.7/Ni/sub 0.3/Zr_{10} alloy are minimal. Three new types of magnetic transitions have been discovered in the Ni(20) alloys. The first occurs in the "as-cast" sample. This is termed a "slow spin-reorientation" transition and occurs over the temperature range $\cong$300 to $\cong$120K. The neutron irradiation eradicated this transition but created two new transitions that occur only with the first cooldown: (1) a "fast spin-reorientation" transition occurring at a temperature or temperature range in the interval 300 280K, and (2) a "fast spin-randomizing" transition with a starting temperature in the 240 to 200K interval. Temperature hysteresis occurs only in the Ni(20) irradiated alloy. 3 refs., 2 figs.

49857 **Fabrication of NbN/AlN superconducting multilayers.** Murduck, J.M.; Vicent, J.; Schuller, I.K.; Ketterson, J.B. (Materials Science Division, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Applied Physics;* **62**: No. 10, 4216-4219(15 Nov 1987). Contract W-31-109-ENG-38.

Multilayers consisting of superconducting niobium nitride alternated with layers of insulating aluminum nitride have been fabricated using dc magnetron reactive sputtering. Under the proper conditions NbN can be produced in a (111) orientation and AlN in a (0001) orientation with an in-plane lattice mismatch of only 0.27%. Proper preparation of the aluminum target was necessary to ensure uniform deposition. X-ray diffraction and transmission electron microscopy verify the layered nature of these samples. Transport properties are studied as they relate to the structure of the system.

49858 **Linear augmented Slater-type orbital study of Pt—5d-transition-metal alloying.** Watson, R.E.; Davenport, J.W.; Weinert, M. (Physics Department, Brookhaven National Laboratory, Upton, New York 11973-5000). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6396-6410(15 Oct 1987). Contract AC02-76CH00016.

We have used a self-consistent density-functional theory with an augmented Slater-type-orbital basis to calculate the heats of formation, charge components, and densities of states for ordered 5d-transition-metal—platinum alloys. Crystal structures considered were CsCl, CuAu-I, AuCd, CrB, Cu_3Au, Al_3Ti, $MoSi_2$, and $MoPt_2$, though not all structures were calculated for each alloy system. Calculated heats of formation are in accord with the limited experimental data for close-packed systems; however, the ill-packed CrB structure cannot be described sufficiently well with our muffin-tin potentials. Correct phase-diagram behavior, i.e., the correct structure at a given composition and the competition between phases at different composition, is predicted. Charge transfer was inspected with use of the orbital population and Wigner-Seitz sphere counts as were two observables sensitive to charge behavior. These were the electron contact density at the nucleus and the initial-state shift of core-electron energy levels. Neither of these are simply related to the charge-transfer terms. In addition, the charge transfer does not correlate with traditional notions concerning differences in electronegativity. One complication, encountered previously in calculations for Au alloys, is that a significant component of the change in charge at an atomic site upon alloying has nothing to do with charge transfer, hybridization, or screening in the traditional chemical sense but is, instead, simply associated with the overlap of tails of charge best understood as being associated with orbitals centered on neighboring sites.

49859 **Optical response of an embedded atom: Resonant photoemission from uranium.** Zangwill, A.; Liberman, D.A. (School of Physics, Georgia Institute of Technology, Atlanta, Georgia 30332). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6705-6707(15 Oct 1987).

We have studied the effect of solid-state hybridization on the resonant photoemission process by means of relativistic time-dependent local-density calculations for a single uranium atom embedded in a spherical drop of jellium. The computed total absorption is in good agreement with experiment. We find a dramatic suppression of 5f photoemission relative to that of the free atom.

49860 **Longitudinal sound measurements on UPt_3 in a magnetic field.** Qian, Y.J.; Xu, M.-F.; Schenstrom, A.; Baum, H.-P.; Levy, M.; Sarma, B.K.; Ketterson, J.B.; Hinks, D. (Wisconsin Univ., Milwaukee, USA; Northwestern Univ., Evanston, IL, USA. Dept. of Physics and Astronomy; Argonne National Lab., IL, USA). *Solid State Communications;* **63**: No. 7, 599-602(Aug 1987).

A new feature (a peak) is found in the magnetic field dependence of the longitudinal ultrasound attenuation in UPt_3. Below the peak, the attenuation varies linearly with field. Above the peak a parabola develops. The peak, at the change over from linear to parabolic behavior, may correspond to a phase transition in the vortex lattice.

49861 Breakaway corrosion of Fe-Cr alloys in atmospheres containing sulfur and oxygen. Choi, S.H.; Stringer, J. (Lawrence Berkeley Lab., CA, USA; Electric Power Research Inst., Palo Alto, CA, USA). *Materials Science and Engineering;* **87**: 237-242(Mar 1987). (CONF-860718—).

From High temperature corrosion international symposium; Marseilles, France (7 Jul 1986).

The object of this study is to investigate the mechanism of the breakaway so that the possibility of its happening can be estimated from short-term tests. It is suggested that breakaway involves the development of a 'critical microstructure' characterized by considerable intrusions of relatively coarse Cr/sub 2/O/sub 3/ fingers into the metal substrate. It is shown that these intrusions involve the progressive oxidation of a CrS 'leader'. This also causes the oxide fingers to be porous, allowing gaseous species easy access to the reaction front. (orig./IHOE).

49862 Effect of surface-applied reactive metal oxides on the high temperature oxidation of alloys. Hou, P.Y.; Stringer, J. (Lawrence Berkeley Lab., CA, USA; California Univ., Berkeley, USA. Dept. of Materials Science and Mineral Engineering; Electric Power Research Inst., Palo Alto, CA, USA). *Materials Science and Engineering;* **87**: 295-302(Mar 1987). (CONF-860718—). Contract AC03-76SF00098.

From High temperature corrosion international symposium; Marseilles, France (7 Jul 1986).

The influence of surface-applied nitrate-converted CaO, CeO/sub 2/, Y/sub 2/O/sub 3/, La/sub 2/O/sub 3/, HfO/sub 2/ and ZrO/sub 2/ on the oxidation behavior of Co-15wt.%Cr, Co-25wt.% Cr and Ni-25wt.%Cr alloys at 1000 and 1100/sup 0/C in O/sub 2/ at 1 atm has been studied. None of the surface-applied oxides promoted Cr/sub 2/O/sub 3/ formation on the Co-15wt.%Cr alloy. Some (but not all) promoted Cr/sub 2/O/sub 3/ formation on Co-25wt.%Cr at 1000/sup 0/C and this appears to be because in these cases the surface-applied oxide acts as a physical barrier to O/sub 2/. At 1100/sup 0/C, there was no apparent effect. For Ni-25wt.% Cr alloy, some of the reactive oxides had a profound effect on the oxidation behavior. The scale adhesion was greatly improved; the oxide growth direction was reversed and the growth rate of the oxide diminished. The results are compared and discussed with the effects found when the reactive element oxides are present as dispersions within the alloys.

49863 Optical radiation measurements. Milam, D.; Peluso, S.E. (Lawrence Livermore National Lab., Livermore, CA). pp 48-55 of Optical radiation measurements. Sanders, A.A. Bellingham, WA; SPIE Society of Photo-Optical Instrumentation Engineers (1985). (CONF-840872—). Contract W-7405-ENG-48.

From SPIE annual technical symposium; San Diego, CA, USA (19 Aug 1984).

Laser pulses with intensities ranging from 10/sup 9/-10/sup 11/ watts/cm/sup 2/ are routinely used at Livermore to measure nonlinear properties of optical materials. The energy in each of these pulses is measured with an absorbing glass calorimeter. Both vidicon cameras and photographic emulsions are used to record the fluence distribution in laser beams. Pulse waveforms are recorded by a streak camera, or by a combination of a photodiode and an oscilloscope. This paper describes procedures for using this data to determine the fluence and intensity for short duration laser pulses.

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REFER ALSO TO CITATION(S) 49863, 50053, 50797, 50829

49864 (CEA-CONF—8870) Densification of Y/sub 2/O/sub 3/ by HIP. Valin, F.; Maire, P.; Boncoeur, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Physico-Chimie). Nov 1986. 17p. (CONF-8611174—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752816.

From 3. ISU conference; London, UK (10 Nov 1986).

Densification of Y/sub 2/O/sub 3/ by HIP was investigated in the range 1250/sup 0/C-1550/sup 0/C at a pressure of 150 MPa. Runs were made in metallic capsules with 200 g of powder. The powder under investigation is 99.9% purity, supplied by RHONE-POULENC. The study reveals the importance of residual gases in the HIP technique of powder densification. The density of the final product is in the range 93% to 100% of theoretical density depending on pretreatment (or outgassing) of the powder. Residual gases have been identified. Final products have been characterized by microscopy (grain size, porosity, microhardness). Porosity and grain size depend on pretreatment conditions. In particular a 1200/sup 0/C pretreatment results in zero porosity and significant decrease of grain size. 4 tables, 11 figs, 16 refs.

49865 (CONF-870272—8) Sulfide capacities of MnO-SiO_2 slags. Reddy, R.G.; Blander, M. (Argonne National Lab., IL (USA)). Feb 1987. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011492.

From American Institute of Metallurgical Engineers annual meeting: light metals session; Denver, CO, USA (22 Feb 1987).

Sulfide capacities of the binary molten MnO-SiO_2 slag calculated a priori based on fundamental solution concepts, are in excellent agreement with measurements in the entire range of acidic and basic compositions. Our results are more accurate than calculations based on the concept of optical basicity even when the parameters used to define basicity have been empirically adjusted to fit data on a manganese oxide containing slag. Our method makes it clear why a concept that uses a single parameter, such as optical basicity, cannot accurately describe sulfide capacities. 12 refs., 3 figs., 2 tabs.

49866 (CONF-8708129—1) The charge state of iron implanted into sapphire. McHargue, C.J.; Sklad, P.S.; White, C.W.; Farlow, G.C.; Perez, A.; Kornilios, N.; Marest, G. (Oak Ridge National Lab., TN (USA); Wright State Univ., Dayton, OH (USA); Lyon-1 Univ., 69 (France)). Aug 1987. Contract AC05-84OR21400. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014053.

From NATO-ASI conference on materials modification by high-fluence ion beams; Viana do Castelo, Portugal (24 Aug 1987).

Several techniques (RBS, TEM, CEMS) have been used to characterize sapphire single crystals implanted with iron at room temperature to fluences of 10^{16} to 10^{17} ions cm^{-2}. At low fluences the as-implanted iron is found mainly in the ferrous state. As the fluence is increased, Fe^{3+} and metallic iron clusters became dominant. There is a strong correlation between the probability of finding specific configurations of iron ions within four cation coordination shells and the relative amounts of each charge state observed. The superparamagnetic behavior of the clusters suggest that they are of the order of 2 nm in size but the large amount of irradiation-induced damage and residual stress has prevented their imaging by TEM. 13 refs., 7 figs.

49867 (EGG-M—15687) Joining of silicon carbide reinforced ceramics. Coon, D.N.; Neilson, R.M. Jr. (EG and G Idaho, Inc., Idaho Falls (USA)). May 1987. Contract AC07-76ID01570. 36p. (CONF-8705103—12). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014881.

From Fossil energy materials program conference; Oak Ridge, TN, USA (19 May 1987).

This research program will identify and develop techniques for joining silicon carbide fiber-reinforced ceramic composites of tubular geometries, primarily through the use of glass joining materials. The general tasks include: identifying, preparing, and charac-

terizing glass compositions suitable for joining ceramic/ceramic composites; developing a joining methodology and evaluating the effects of process parameters on joint characteristics; fabricating and characterizing joints; and determining physical/mechanical properties and failure behavior of joints under ambient conditions, elevated temperatures, and simulated service environments. The majority of the effort during the last year has been directed towards characterization of glass compositions for use as joining materials. The following requirements for the glass brazing material were identified: the glass joining material should melt and flow at temperatures below those reported to degrade the properties of the composite material (approximately 1200°C); the glass joining material should not exhibit excessive chemical reactivity with SiC; ideally, the devitrified glass joint should exhibit good mechanical properties to 1000°C; and the glass composition should devitrify to crystalline phases which exhibit low thermal expansion and good chemical resistivity to promote thermal and chemical stability of the resulting joint. This review discusses the results of characterization studies of candidate joining glasses with respect to the above criteria. Also discussed are the results of some initial joining experiments. 6 refs., 19 figs., 5 tabs.

49868 (INIS-BR—688, pp 249) **Self-supportable targets of sup (10,11)B for studying nuclear reactions.** Koide, K.; Coimbra, M.M.; Takai, H. (Sao Paulo Univ., Brazil. Inst. de Fisica; Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

49869 **(INIS-BR—749) Studies of alumina additions in zirconia - magnesia.** Muccillo, R. (Associacao Brasileira de Ceramica, Sao Paulo). 1987. 13p. (In Portuguese). (CONF-8705175—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703500.

From 31. Brazilian congress on ceramics; Brasilia, DF, Brazil (24 May 1987).

Ionic conductivity measurements have been carried out in the 500/sup 0/C - 1000/sup 0/C temperature range in Mg - PSZ (Partially Stabilized Zirconia) with 0.5 to 10 mol % alumina additions. All specimens were prepared by pressing followed by pre - and sintering at 1000/sup 0/C/2h and1450/sup 0/C/4h, respectively. Thermal hysteresis of the ionic conductivity have been detected, probably due to phase changes in the Mg-PSZ samples. The results show that alumina additions up to 2.1% enhances densification with no major variations in electrical resistivity values.

49870 (INIS-BR—794, pp 3) **Dosimetric lithium fluoride production.** Campos, L.L. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

49871 **(INIS-BR—821) β->α phase transformation in SiC.** Bressiani, A.H.A. (Sociedade Brasileira de Microscopia Eletronica, Rio de Janeiro). 1985. 1p. (In Portuguese). (CONF-8509411—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703718.

From 10. colloquium of the Brazilian Society of Electron Microscopy; Sao Paulo, Brazil (1 Sep 1985).

Published in summary form only.

49872 **(LA-UR—87-1991) Ion mixing of Ti/C and Fe/C bilayers.** Nastasi, M.; Tesmer, J.R.; Hirvonen, J.P. (Los Alamos National Lab., NM (USA); Helsinki Univ. (Finland). Dept. of Physics). Jun 1987. Contract W-7405-ENG-36. 6p. (CONF-871124—1). NTIS, PC A02. File Number DE87011777.

From Fall meeting of the Materials Research Society; Boston, MA, USA (30 Nov 1987).

Bilayer samples of Ti/C and Fe/C have been ion beam mixed with 400-keV Xe ions to a dose of 1 x 10^{16} ions/cm^2. Mixing experiments were performed at 77, 300, 573, and 723°K. The transition between the temperature-independent and temperature-dependent mixing occurred between 300 and 573°K in Fe/C samples and between 573 and 723°K in Ti/C sample. In the temperature-independent mixing regime, mixing is reasonably well explained by a thermodynamic model of ion mixing while at higher temperatures a radiation enhanced diffusion mechanism is evident. 12 refs., 4 figs., 1 tab.

49873 **Equation-of-motion method for the study of defects in insulators: Application to a simple model of TiO_2.** Halley, J.W.; Shore, H.B. (School of Physics and Astronomy, University of Minnesota, Minneapolis, Minnesota 55455). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6640-6645(15 Oct 1987).

We illustrate the advantages of an equation of motion technique for calculation of the electronic structure of oxides. The technique is described in some detail and applied to a simplified version of a tight-binding model of TiO_2 due to Vos. We can determine the density of states of systems with arbitrary numbers of oxygen vacancies in this model with very modest expenditures of computer time. We discuss some physical implications of the results.

49874 **X-ray-absorption near-edge-structure study of La/sub 2-//sub x/(Ba,Sr)/sub x/CuO/sub 4-//sub y/ superconductors.** Tranquada, J.M.; Heald, S.M.; Moodenbaugh, A.R. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] B: Condensed Matter;* **36**: No. 10, 5263-5274(1 Oct 1987). Contract AC02-76CH00016.

Superconductors with the composition La/sub 2-//sub x/(Ba,Sr)/sub x/CuO/sub 4-//sub y/ and x = 0.0 to 0.3 have been studied through measurements of x-ray-absorption near-edge-structure at the Cu K and La L edges. Contrary to recent band-structure calculations, we find that the Cu 3d electrons are localized with the copper ions having an integral $3d^9$ configuration (2 + valence) independent of dopant concentration. Variation in the area of the "white lines" at the La L/sub 2,3/ edges with doping indicates that reduction of the valence charge results in an increase in unoccupied states (probably consisting of holes in the O 2p band) having d symmetry relative to the La site. These O 2p holes also appear to have d symmetry with respect to the Cu sites.

49875 **Ultrasound anomaly at Tsub(c) in $YBa_2Cu_3Osub(y)$.** Migliori, A.; Gruener, G.; Ting Chen; Alavi, B. (Los Alamos National Lab., NM, USA; California Univ., Los Angeles, USA. Dept. of Physics). *Solid State Communications;* **63**: No. 9, 827-829(Sep 1987).

We measured the fundamental longitudinal acoustic resonant frequency fsub(r) of polycrystalline samples of $YBa_2Cu_3Osub(y)$. The frequency increases with decreasing temperature and displays a sharp rise as we cool below Tsub(c). The fractional change in frequency at Tsub(c), Δfsub(r)/fsub(r), is 4.5 x 10^{-3} and is opposite in sign to that expected at the usual second-order superconducting transition.

49876 **Antiferromagnetism of La_2CuO/sub 4-//sub y/ studied by muon-spin rotation.** Uemura, Y.J.; Kossler, W.J.; Yu, X.H.; Kempton, J.R.; Schone, H.E.; Opie, D.; Stronach, C.E.; Johnston, D.C.; Alvarez, M.S.; Goshorn, D.P. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review Letters;* **59**: No. 9, 1045-1048(31 Aug 1987). Contract AC02-76CH00016.

Zero-field spin precession of positive muons has been observed in the antiferromagnetic state of La_2CuO/sub 4-//sub y/. Sharp onsets of the sublattice magnetization are found at temperatures close to those of the susceptibility maxima of different specimens. The long-lived precession signal indicates a microscopically homogeneous distribution of spin density at each Cu atom below the Neel temperature. Combination of the present results and neutron-scattering studies indicates the ordered moment per Cu atom to be significantly less than 1μ/sub B/.

49877 **Magnetic and thermal measurements on high-Tsub(c) (Lasub(0.9)Basub(0.1))$_2$CuOsub(4-y).** Zirngiebl, E.; Willis, J.O.; Thompson, J.D. (Los Alamos National Lab., NM, USA). *Solid State Communications;* **63**: No. 8, 721-724(Aug 1987).

We have measured the magnetic moment of (Lasub(0.9)Basub(0.1))$_2$CuOsub(4-y) as a function of temperature and magnetic field and have found the onset of superconductivity at a temperature T approx. = 35 K. From the magnetic field dependencies, we have shown that the sample is a type-II superconductor with kappa approx. = 11. Specific heat measurements yield a finite electronic specific heat coefficient of approx. 6 mJ/mole-K^2 at 4 K and a Debye temperature of only 330 K, suggesting that a strong electron-phonon interaction may be responsible for the high Tsub(c) in our sample.

49878 **Structural phase transition in YBa$_2$Cu$_3$Osub(7-delta): the role of dimensionality for high temperature superconductivity.** Schuller, I.K.; Hinks, D.G.; Beno, M.A.; Capone, D.W.; Soderholm, L.; Locquet, J.-P.; Bruynseraede, Y.; Segre, C.U.; Zhang, K. (Argonne National Lab., IL, USA; Katholieke Universiteit Leuven, BE. Lab. voor Vaste Stof Fysika en Magnetisme; Illinois Inst. of Tech., Chicago, USA. Dept. of Physics). *Solid State Communications;* **63**: No. 5, 385-388(Aug 1987). Contract W-31-109-ENG-38.

We have performed detailed high temperature X-ray diffraction to study the nature of the structural phase of YBa$_2$Cu$_3$Osub(7-delta). The results indicate the existence of a reversible orthorhombic to tetragonal phase transition at a temperature close to 750°C. If the high temperature tetragonal phase is quenched-in at low temperatures the critical superconducting temperature is considerably reduced from 92.5 K. This suggests that the one dimensional Cu-O chains present in the orthorhombic structure are necessary for high temperature superconductivity.

3606 Other Materials

REFER ALSO TO CITATION(S) 49488, 49488, 49863, 49996, 50005, 50031, 50044, 50068, 50149, 50165, 50820, 50821

49879 **(BNL—40220) Spin fluctuations in EuS above T/sub c/: Comparison with asymptotic renormalization-group theory.** Boeni, P.; Shirane, G.; Bohn, H.G.; Zinn, W. (Brookhaven National Lab., Upton, NY (USA); Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). 1987. Contract AC02-76CH00016. 12p. (CONF-871126—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014911.

From 32. conference on magnetism and magnetic materials; Chicago, IL, USA (9 Nov 1987).

Constant energy scans in neutron scattering provide a very sensitive tool for theoretical line shapes in detail. In order to verify the predictions of asymptotic renormalization group theory for isotropic ferromagnets above T/sub c/ we measured the temperature dependence of the paramagnetic scattering from the Heisenberg ferromagnet EuS. The width of the constant E peaks increases with increasing temperature as predicted. Surprisingly the positions do not scale. The nonuniversal behaviour is attributed to the crossover from isotropic to dipolar dynamics. 11 refs.

49880 **(DOE/ER/05489—T2) The structure and reactivity of heterogeneous surfaces and study of the geometry of surface complexes: Progress summary (1977-1985) and progress report for January 1, 1985-December 31, 1985.** Landman, U. (Georgia Inst. of Tech., Atlanta (USA). School of Physics). 1985. Contract AS05-77ER05489. 45p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87014168.

Our research program focused on four major materials science areas: (1) surface, interface and interphase-interface phenomena; (2) phase transformations; materials growth and materials processing; (3) small material aggregates; and systems in confirming environments. The complex nature of the materials systems required a research program which combined novel theoretical methods and modeling strategies with established theoretical analytical techniques. In particular, studies of certain of the materials problems required special modeling considerations and simulation techniques which while preserving the complexity (and reality) of the system under study, rendered it soluble thus allowing systematic studies. 44 refs., 2 figs.

49881 (IAEA-TECDOC—409, pp 313-324) **Three generations of neutron transmutation doping of silicon at Risoe National Laboratory.** Andresen, K.; Heydorn, K.; Hansen, K. (Risoe National Lab., Roskilde, Denmark). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The first commercial irradiation of silicon was performed at Risoe in April 1974 for the Danish company Topsil. The 1-2 inch silicon crystals were irradiated in an aluminium can in a horizontal graphite stringer in the thermal column of reactor DR2. While the demand for NTD-silicon was growing, it was decided to close down the reactor DR2, and construction of an irradiation facility in reactor DR3 became necessary. Reactor DR3 is a 10 MW heavy water cooled and moderated research reactor. In September 1975 a 3 inch silicon irradiation facility was installed in DR3 in the graphite reflector in a vertical tube with a diameter of 100 mm. In 1977 four more facilities were installed in the graphite reflector in DR3. Quality control is made by placing cobalt wires in the irradiation can, and measuring the /sup 60/Co-activity to verify that each batch gets the right neutron fluence. In 1980 it was decided to construct a new irradiation facility to be placed in a vertical tube in the heavy water tank for irradiating up to 4 inch crystals. There are now two 4 inch facilities in operation after initial problems have been solved. 4 refs, 7 figs.

49882 **(INIS-BR—676) Study of the conductivity induced by radiation in teflon irradiated by X-ray.** Faria, R.M. (Sao Paulo Univ., Sao Carlos, SP (Brazil). Inst. de Fisica e Quimica). 1980. 108p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. File Number DE87703436.

The X-ray induced currents in teflon FEP were measured which show the following features: a) At the beginning the current increases and reaches a maximum at about 10s, b) It decays slowly during 30 minutes, when a steady state is reached the delayed conductivity was also measured. The sample were 25 μm thick and the irradiated area was 12,5 cm/sup 2/; the applied field was of the order of 10/sup 4/ V/cm and the dose rate of order of 10/sup 2/ R/S. It was observed that a new measurement of the induced conductivity does not duplicate the first one, but after a few hours it comes back to the original one. In order to show that the increase and the decrease of the current is not caused by an electric field effect we realized a measurement where we polled the sample intermitently while it was irradiated. The current thus obtained had about the same values of the first measurement, when the voltage was applied all the time during the measurement. The absorption current of a teflon sample which shows after some days the effect of its variation due the variation of the ambiental temperature are measured.

49883 **(INIS-BR—763) Formation of aluminium titanate by solid state reaction of alumina and titania and its reinforcement by zirconia.** Pandolfelli, V.C.; Varela, J.A.; Longo, E. (Santa Catarina Univ., Florianopolis (Brazil)). 1986. 5p. (In Portuguese). (CONF-861299—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703701.

From 7. Brazilian congress on engineering and materials science; Florianopolis, SC, Brazil (10 Dec 1986).

The compund β-Al/sub 2/TiO/sub 5/ was obtained from the reaction of 50mol% of TiO/sub 0/2 and 50 mol% of Al/sub 2/O/sub 3/ at temperatures ranges of 1350 to 1580/sup 0/C. The β phase is instable for thermal treatments at 900/sup 0/C, decomponding in Al/sub 2/O/sub 3/ and TiO/sub 2/. The addition of 15 mol % of ZrO/sub 2/ or Zr SiO/sub 4/ to the compostion of Al/sub 2/TiO/sub 5/ results in the formation of ZrTiO/sub 4/ at temperatures lower than 1300/sup 0/C and the ZrTiO/sub 4/ compound decomposes between 1500 and 1580/sup 0/C in ZrO/sub 2/ t. and TiO/sub 2/. The creation of microcracks in the interface

matrix /ZrO/sub 2/ due to the transformation t. ->m. of ZrO/sub 2/ and the amorphous silica located at the grain boundary can be responsible by the increase in the mechanical resistance and responsible by the thermal shock in Al/sub 2/TiO/sub 5/. (E.G.).

49884 (INIS-BR—838, pp 64) **Modification of adhesion of gold thin films on teflon by protons bombardment.** Szwec, J.; Livi, R.P. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

49885 (INIS-BR—838, pp 68) **Carbonaceous deposition on targets exposed to particle beam: an interesting multidisciplinary problem.** Jeronymo, J.M.F.; Silveira, E.F. da. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

49886 (LA-UR—87-2611) **Soliton twin boundaries of the cubic-tetragonal martensitic transformations in ferroelastic materials.** Mazor, A.; Bishop, A.R. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 12p. (CONF-8705168—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE87014741.

From Workshop on competing interactions and microstructures: statics and dynamics; Los Alamos, NM, USA (5 May 1987).

Described here is one set of results from a comprehensive study of the cubic-tetragonal Martensitic transformations in ferroelastic materials. The model being used is the soliton model of Barsch and Krumhansl which exhibits a first-order cubic-tetragonal martensitic phase transition. This is a nonlinear and nonlocal three-dimensional continuum model, with a two-component strain order parameter. The structure and the energy of the static (or traveling) soliton strain boundaries, associated with the minimal total free energy, is calculated at all temperatures. Insight is also gained of the corresponding type of trajectories in the order parameter space. Approaching the first-order transition temperature from below, the tetragonal-tetragonal soliton wall splits gradually into two cubic-tetragonal solitons of finite width. Their separation, however, diverges at the transition temperature. This temperature is the border point between two topologically different classes of domain walls, which apparently have also different time-dependence. Below the transition point the kink-like solutions are of traveling type, but above the transition temperature the pulse-like walls are not.

49887 (LA-UR—87-2774) **The Moessbauer effect of SnI_4 at high pressures.** Taylor, R.D.; Pasternak, M.; Farrell, J.N. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 5p. (CONF-870825—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014771.

From International conference on the applications of the Mossbauer effect; Melbourne, Australia (17 Aug 1987).

Tetravalent tin iodide is a molecular crystal composed of SnI_4 tetrahedra loosely packed into a cubic configuration. Under pressure SnI_4 becomes metallic at about 15 GPa. We report a Moessbauer effect study of ^{119}Sn and ^{129}I in SnI_4 to pressures of 26 GPa. The spectra exhibit dramatic changes with pressure starting at about 10 GPa and show large pressure hysteresis effects upon reducing the pressure from 26 GPa. In the intermediate region tin exists in both Sn^{4+} and Sn^{2+} states, and iodine exists in two nonequivalent sites characterized by a different symmetry and different sign and magnitude of the electric field gradient. 11 refs., 6 figs.

49888 (LBL—22904) **Imaging and analysis of carbon distribution in GaAs using radioactive tracer ^{14}C.** Bourret, E.D.; Guitron, J.B.; Haller, E.E. (Lawrence Berkeley Lab., CA (USA)). Jun 1987. Contract AC03-76SF00098. 17p. (CONF-870799—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000189.

From American conference on crystal growth; Monterey, CA, USA (13 Jul 1987).

Microscopic segregation of carbon in GaAs has been studied using autoradiography of a crystal doped with radioactive tracer ^{14}C. The autoradiographs were compared to images of the wafers obtained by photoetching and by high resolution scanning photoluminescence microscopy. It was found that the carbon distribution is homogeneous within the limit of the resolution of the radiographs of about 15 μm, and that there is no correlation between the carbon distribution and the luminescence contrast. 11 refs., 6 figs.

49889 (PB—87-204459/XAB) **Production of concrete containing fly ash for structural applications. Research report.** Archuleta, L.G.; Tikalsky, P.J.; Carrasquillo, R.L. (Texas Univ., Austin (USA). Center for Transportation Research). May 1986. 156p. (CTR—3-9-84-364-1). NTIS, PC A08/MF A01.

See also PB—87-202859.

Structural applications of concrete fly ash have been limited mainly to high-strength concrete in the past. The trend is primarily due to the lack of information available to the resident engineer concerning curing conditions, setting times, strength characteristics, and durability of normal-strength fly-ash concrete. The study addresses some of the major concerns of resident highway engineers on concrete containing fly ash for structural concrete in highway applications. The report summarizes the experimental observations and conclusions from a research program investigating the properties of both fresh and hardened structural concrete containing fly ash.

49890 (PB—87-204467/XAB) **Rapid repair of wet asphaltic concrete using fly ash. Research report.** Cherem-Sacal, D.; Price, D.A.; Fowler, D.W.; Meyer, A.H. (Texas Univ., Austin (USA). Center for Transportation Research). Nov 1985. 153p. (CTR—3-18-83-359-2). NTIS, PC A08/MF A01.

During periods of wet weather, particularly when it is also cold, asphalt pavements develop potholes that cannot be immediately repaired with conventional asphalt materials. Materials are needed that can be successfully used to repair asphalt pavements in wet, or cold and wet, weather. The materials should be of reasonable cost and have at least a moderate life of one to three years. The work described in this volume is a summary of the research done on fly ash as part of the study.

49891 (PB—87-209326/XAB) **Program description of FIBRAM (Fiber Optic Radiation Attenuation Model): a radiation attenuation model for optical fibers.** Ingram, W.J. (Department of Commerce, Boulder, CO (USA). Inst. for Telecommunication Sciences). Jun 1987. 115p. (NTIA—87-216). NTIS, PC A06/MF A01.

The report describes a fiber-optics system model and its computer implementation. This implementation can calculate the bit error ratio (BER) versus time for optical fibers that have been exposed to gamma radiation. The program is designed so that the user may arbitrarily change any or all of the system input variables and produce separate outputs. The primary output of the program is a table of the BER as a function of time. This table may be stored on magnetic media and later incorporated into computer graphic programs. The program was written in FORTRAN 77 for the IBM PC/AT/XT computers. Flow charts and program listings are included in the report.

49892 (PB—87-209995/XAB) **Effectiveness of fly-ash replacement in the reduction of damage due to alkali-aggregate reaction in concrete. Research report.** Farbiarz, J.; Carrasquillo, R.L. (Texas Univ., Austin (USA). Center for Transportation Research). May 1986. 119p. (CTR—3-9-85-450-1). NTIS, PC A06/MF A01.

The concrete industry is faced with the urgent need of improving its knowledge about the mechanism by which fly ash helps in the reduction of damage due to alkali-aggregate reaction in concrete to acceptable levels. The main objective of the research was to identify the most-relevant components of fly ash, cement, and concrete aggregates affecting the alkali-aggregate reaction, and to find a relationship between them, indicating type and amount of a given component acceptable for use in concrete to ensure no

damage due to alkali-aggregate reaction. The research approach used in the investigation was to conduct a comparative study of the behavior of several mixes made using several aggregate sources in combination with cements with high and low alkali content, and containing different types of fly ash at different replacement percentages. The variables studied included alkali content of the cement, available alkali content of the fly ash, degree of alkali reactivity of the aggregate, type and source of fly ash, and percentage of cement replaced.

49893 **(PB—87-210308/XAB) Effects of radiation damage in optical fibers: a tutorial.** Englert, T.J. (Wyoming Univ., Laramie (USA). Dept. of Electrical Engineering). May 1987. 63p. NTIS, PC A04/MF A01.

This report discusses the physics and some measured results of the effects of radiation damage in optical fibers. Examples are illustrated and discussed. The kinds and amounts of radiation are analyzed with regard to their relation to the capacity of single-mode and multi-mode optical fibers.

49894 **Selective porous silicon formation in buried p^+ layers.** Tsao, S.S.; Myers, D.R.; Guilinger, T.R.; Kelly, M.J.; Datye, A.K. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **62**: No. 10, 4182-4186(15 Nov 1987). Contract AC04-76DP00789.

We report a systematic microstructural study of enhanced lateral porous silicon formation in the buried p^+ layers of $n/p^+/p^-$ and $p^-/p^+/p^-$ structures. We find, surprisingly, extremely selective porous silicon formation due to the thin p^+ layer in both structures, despite the absence of a p-n junction in the $p^-/p^+/p^-$ structure. The interface between the isolated island and the buried porous silicon layer was always located at the depth where the net p-type dopant concentration was 1—8 x $10^{15}/cm^3$. The observed microstructure can largely be understood in terms of a recent model for porous Si formation in uniformly doped Si, proposed by Beale et al. [J. Cryst. Growth 73, 622 (1985)]. However, we also observe, for the first time, important effects unique to a nonuniform dopant concentration.

49895 **Characterization of GaAs wafers and epilayers with electron-beam-induced current, etching, and reflected light.** Partain, L.D.; Dean, S.M.; Berard, B.L.; McLeod, P.S.; Fraas, L.M.; Cape, J.A.; Sheldon, P. (Chevron Research Company, Richmond, California 94802). *Journal of Applied Physics;* **62**: No. 10, 4248-4254(15 Nov 1987).

We have used a combination of electron-beam-induced current (EBIC), etching, and optical measurements to show dramatic differences between the minority-carrier transport properties and defect structures in GaAs wafers from two different vendors. We found that the EBIC defects correspond to the traditional ones found with molten KOH etching and optical inspection. However, the EBIC micrographs give a great deal of additional information. The EBIC patterns from the first vendor's wafer showed diagonal striations and point defects that made the EBIC go to zero and were interconnected by wormlike lines. The second vendor's wafers showed EBIC point defects that only suppressed the response by 20% and gettered the surrounding material so that it had higher EBIC response. However, this second vendor's wafer had about a 15% overall lower EBIC response and a much higher density of surface polish defects identified by reflected light. Etching data showed that EBIC defects are bulk material properties and that electrochemical etching with a KOH electrolyte allows the wormlike defects to be seen optically in a Nomarski equipped microscope. Examination of epilayers showed that the wafer defects did not propagate up into a 4-μm-thick layer grown by vacuum chemical epitaxy or a 1.5-μm-thick layer grown by molecular-beam epitaxy.

49896 **About liquids.** Bernstein, H.J.; Weisskopf, V.F. (School of Natural Science, Hampshire College, Amherst, Massachusetts 01002; Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *American Journal of Physics;* **55**: No. 11, 974-983(Nov 1987).

On the basis of a simplified depiction of liquids, solids, and gases, a qualitative discussion is presented of certain properties of liquids with spherically symmetric atoms: their melting and boiling heats and the corresponding temperatures, their coefficients of viscosity and self-diffusion. Results are compared with data for neon, argon, sodium, aluminum, copper, silver, and mercury. Water is also included for order-of-magnitude comparison, although its molecules are not spherically symmetric and internal degrees of freedom cannot be neglected.

49897 **Formation of epitaxial layers of Ge on Si substrates by Ge implantation and oxidation.** Fathy, D.; Holland, O.W.; White, C.W. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831). *Applied Physics Letters;* **51**: No. 17, 1337-1339(26 Oct 1987). Contract AC05-84OR21400.

Thin epitaxial layers of Ge-Si alloys have been formed on Si(100) substrates by steam oxidation of Ge-implanted samples. During the oxidation, the Ge is totally piled up ahead of the SiO_2/Si interface. This segregation of Ge leads to the formation of a distinct, Ge-rich layer which is epitaxial with the underlying Si. The thickness of the Ge layer is dependent on the implantation dose. This layer and its two bounding interfaces with the oxide and Si are characterized as a function of the implantation dose and energy, using Rutherford backscattering and high-resolution transmission electron microscopy.

49898 **Interatomic Auger rates for the sodium fluoride crystal.** Green, T.A.; Jennison, D.R. (Sandia National Laboratories, P.O. Box 5800, Albuquerque, New Mexico 87185-5800). *Physical Review [Section] B: Condensed Matter;* **36**: No. 11, 6112-6119(15 Oct 1987). Contract AC04-76DP00789.

Interatomic Auger rates for the NaF crystal are calculated for initial 1s, 2s, and 2p holes in the Na^+ ion. The crystal is simulated by a (NaF_6)/sup 5-/ cluster embedded in a large number of point ions, and the one-electron orbitals are obtained from restricted Hartree-Fock calculations of the initial state. The continuum-electron orbital is obtained from the Coulomb potential for a spherically averaged superposition of atomic charge densities for the initial state, and exchange is treated by the method of Riley and Truhlar. The continuum orbital is orthogonalized to the occupied molecular orbitals. The calculated Na(KLL) rate is about 20% greater than the experimental value. The calculated interatomic Auger widths for the transitions Na(1s)Na(2p)F(2p), Na(2s)Na(2p)F(2p), and Na(2p)F(2p)F(2p)′ [following the notation of J. A. D. Matthew and Y. Komninos, Surf. Sci. 53, 716 (1975)] are 0.001 73, 0.641, and 0.153 eV, respectively. For comparison, the width of the Na(KLL) Auger transition is close to 0.26 eV. All three interatomic transitions have been identified by Citrin, Rowe, and Christman. Widths for the transitions Na(1s)Na(2p)F(2p) and Na(2p)F(2p)F(2p)′ can be inferred from experimental data. Theory and experiment agree to within 50%. This represents a considerable improvement over previous theoretical treatments.

49899 **Electron-induced extended-fine-structure measurements of thin-film growth and reaction.** Idzerda, Y.U.; Williams, E.D.; Einstein, T.L.; Park, R.L. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *Physical Review [Section] B: Condensed Matter;* **36**: No. 11, 5941-5948(15 Oct 1987).

The application of two electron-beam-induced extended-fine-structure (EFS) techniques [surface extended energy-loss fine structure (SEELFS) and extended appearance-potential fine structure (EAPFS)] to the study of thin films has been demonstrated by measurements on three well-characterized compositional phases of titanium deposited on Si(111). The EFS above the Ti L/sub 2,3/ edge have been measured for an unannealed (20 °C) pure Ti overlayer, a 250 °C-annealed layer (a Si-rich Ti overlayer), and a 400 °C overlayer (a silicide phase). Data were analyzed by using two routines from extended x-ray-absorption fine structure (EXAFS): the standard optical transform (including $\Delta l = +1$ phase shifts) and the ratio method which is independent of phase shifts. The Ti L/sub 2,3/edge EFS satisfies the dipole pseudo-selection-rule of EAPFS, validating the use of $\Delta l = +1$ phase shifts in the EAPFS analysis. The agreement between the measured spectra obtained with SEELFS and EAPFS is very good and is additional confirmation of the use of dipole phase shifts in SEELFS analysis.

49900 **Electrically induced undulations and their competition with electrically induced convection in cholesteric liquid crystals.** Pleiner, H.; Brand, H.R. (Department of Physics, University of Colorado, P.O. Box 390, Boulder, Colorado 80309-0390). *Physical Review [Section] A: General Physics;* **36**: No. 8, 4056-4061(15 Oct 1987).

We show that cholesteric liquid crystals with a sufficiently short pitch, when put in an electric field, can exhibit undulations, the analog of mechanical undulations or of thermal undulations obtained when an external pressure or a temperature gradient is applied, respectively. As the pitch is increased a competition between the electric-field-induced undulations and the electrohydrodynamic instability arises. We give numerical estimates for both instabilities in this system, which represents another example of a competition between a constrained pattern-forming equilibrium system (electric-field-induced undulations) and a nonequilibrium (electrohydrodynamic) instability.

49901 **Raman scattering as a technique of measuring film thickness: interference effects in thin growing films.** McCarty, K.F. (Sandia National Laboratories, Livermore, California 94550). *Applied Optics;* **26**: No. 20, 4482-4486(15 Oct 1987).

Simultaneous Raman-scattering and interferometric-thickness measurements have been made during the growth of sodium sulfate films on Pt/10%Rh substrates. For the experimental geometry, the s-polarized Raman-scattered radiation exhibits oscillations in intensity as a function of film thickness, while no intensity oscillations are observed for the p-polarized Raman scattering. The experimental results are modeled by assuming the interference of the multiple reflections of the incident laser beam and the interference of the multiple reflections of the Raman-scattered radiation. The model predicts extreme oscillations in the Raman signal/film thickness relationship for the s-polarized Raman collection and only small oscillations for the p-polarized Raman collection, in qualitative agreement with the experimental results.

49902 **Vibrational spectrum of amorphous silicon: Experiment and computer simulation.** Kamitakahara, W.A.; Soukoulis, C.M.; Shanks, H.R.; Buchenau, U.; Grest, G.S. (Ames Laboratory, Iowa State University, Ames, Iowa 50011). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6539-6542(15 Oct 1987). Contract W-7405-ENG-82.

The dynamical structure factor $S(Q,\omega)$ and the vibrational density of states $g(\omega)$ for amorphous silicon have been measured by neutron scattering methods. Computer simulations of $S(Q,\omega)$, based on a 216-atom structural model, are in substantial agreement with experiment.

49903 **Diffusivity and neutron scattering study of the Li-defect conversion in MgF_2.** Toulouse, J.; Cox, D.E. (Physics Department, Lehigh University, Bethlehem, Pennsylvania 18015). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6657-6663(15 Oct 1987).

Lithium in MgF_2 has been shown to exist in the form of tightly bound pairs below room temperature. By contrast, at high temperatures (≧900 °C), Li is present mostly as interstitials and diffuses rapidly. In the present study we have attempted to determine the temperature range within which the defect conversion occurs and possible structural reasons for this conversion. We report here diffusivity results for lithium in a single crystal of MgF_2, between 650 and 1100 °C. The diffusivity, D/sub Li/, exhibits a change of slope around 800 °C for both components, respectively parallel and perpendicular to the c axis. Isochronal annealings followed by internal-friction measurements also indicate that the Li pairs may extensively dissociate and convert to interstitials above 700 °C. In order to investigate possible causes for the Li-defect conversion, we have used neutron powder diffraction to measure the lattice parameter as a function of temperature, and have carried out structure refinements at 20 and 849 °C. These measurements show no change in the positional parameters of the fluorine ions and only a small change in lattice parameters between 20 and 849 °C, giving no evidence for a lattice disordering in MgF_2 similar to that in CaF_2. On the other hand, a large increase in the vibrational amplitude of the F ions is observed. It is suggested that this increase may well result in a decrease of the Li-pair binding energy, thereby enhancing the dissociation of Li pairs above 700 °C and the conversion to interstitials, resulting in the high diffusivity.

49904 **Complete excitation spectrum for a charge-density-wave system.** Sherwin, M.S.; Zettl, A.; Richards, P.L. (Department of Physics, University of California, Berkeley, Berkeley, California 94720). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6708-6711(15 Oct 1987).

We report measurements of the far-infrared (FIR) reflectance of the charge-density-wave (CDW) conductor $(TaSe_4)_2I$. In the CDW state, and for incident electric field polarized parallel to the crystal chain direction, the associated FIR conductivity shows a giant resonance at 38 cm/sup -1/. Our results, when combined with previous measurements at lower and higher frequencies, provide the first consistent and complete excitation spectrum of a CDW system. We propose that a giant FIR mode distinct from the pinned CDW mode is a generic feature of CDW systems.

49905 **CR-39 track etching and blow-up method.** Hankins, D.E. (to Dept. of Energy, Washington, DC). US Patent 4,648,950. 10 Mar 1987. Filed date 15 Oct 1985. vp.p. Patent and Trademark Office, Box 9, Washington, DC 20232.

This patent describes a method of etching tracks in CR-39 foil to obtain uniformly sized tracks. The invention comprises a step of electrochemically etching the foil at a low frequency and a "blow-up" step of electrochemically etching the foil at a high frequency. A goal of the invention is to enlarge a broad spectrum of tracks in CR-39. Another goal of the invention is to enlarge all of the enlarged tracks to a more uniform size. Another goal of the invention is to provide a more accurate track count. Another goal of the invention is to allow for a faster track count. Another goal of the invention is to allow for an inexpensive and accurate track count by machine. Another goal of the invention is to selectively enlarge tracks to a more uniform size, suppressing the enlargement of background scratches. Other objects of the invention will become readily apparent to those skilled in the art from the following description and accompanying drawing.

49906 **Optical thin film monitoring using optical fibers.** Thomas, N.L. (Lawrence Livermore National Lab., Livermore, CA). pp 123-129 of Optical thin films II: New developments. Seddon, R.I. Bellingham, WA; Society of Photo-Optical Instrumentation Engineers (1987). (CONF-860880—).

From 30. SPIE technical symposium on optics and optoelectronic engineering; San Diego, CA, USA (17 Aug 1986).

A technique for monitoring optical thin film thickness by direct evaporation onto the end of an optical fiber is described. The optical fiber is suspended inside a coating chamber so that the fiber distal end faces the evaporation source and is illuminated with a chopped light source. The light which is reflected from the fiber end is returned through the fiber and is collected by a 45° mirror with a hole in it. The signal is detected and displayed on LED displays and a chart recorder. Multiple fibers are used to monitor individual layers in a stick, or a single fiber is used after cleaving the end with a tool to produce a clean, flat, uncoated surface without breaking the vacuum.

49907 **Multilayer optical coating fabrication by dc magnetron reactive sputtering.** Pawlewicz, W.T.; Martin, P.M.; Knoll, R.W.; Mann, I.B. (Pacific Northwest Lab., Richland, WA). pp 134-140 of Optical thin films II: New developments. Seddon, R.I. Bellingham, WA; Society of Photo-Optical Instrumentation Engineers (1986). (CONF-860880—). Contract AC06-76RL01830.

From 30. SPIE technical symposium on optics and optoelectronic engineering; San Diego, CA, USA (17 Aug 1986).

A conventional box coating chamber has been equipped with three dc magnetron sputtering cathodes, reactive gas (O/sub 2/, N/sub 2/, H/sub 2/) pressure and flow control, a planetary substrate holder, and optical monitoring to produce a low-temperature bath coating system for multilayer optical coating fabrication using oxides, nitrides, semiconductors, and semitransparent metals. The system realizes the benefits traditionally derived from this geometry: maximum area of uniform coating thickness, spatially averaged

coating flux impingement angles, and precise thickness monitoring. The use of sputtering cathodes adds the benefits of increased flexibility in choice of materials deposited, increased adatom energy at the substrate, and increased chemical reactivity in a gas discharge. Dense, durable, fully reacted dielectric coatings are achieved at low processing temperatures. Metal targets (sources) are used for ease of fabrication, and dc power avoids radio frequency (rf) impedance matching requirements. In this paper, the chamber and components are described; operation of the cathodes is explained; and thickness uniformity profiles, deposition rates, and substrate temperature data are related. A list of materials investigated to date is presented with pertinent optical properties and intrinsic mechanical stress values. Illustrative performance examples for multilayer coatings on glasses and plastics are included.

49908 **Ion-assisted deposition of fluorides.** Targove, J.D.; Messerly, M.J.; Lehan, J.P.; Weng, C.C.; Potoff, R.H.; Macleod, H.A.; McIntyre, L.C. Jr.; Leavitt, J.A. (Univ. of Arizona, Tucson, AZ). pp 115-122 of Optical thin films II: New developments. Seddon, R.I. Bellingham, WA; Society of Photo-Optical Instrumentation Engineers (1986). (CONF-860880—).

From 30. SPIE technical symposium on optics and optoelectronic engineering; San Diego, CA, USA (17 Aug 1986).

Ion-assisted deposition (IAD) has been used to deposit magnesium fluoride, cryolite (Na/sub 3/AlF/sub 6/), and lanthanum fluoride films on ambient temperature substrates. IAD magnesium fluoride coatings show increased density and moisture resistance, while IAD lanthanum fluoride coatings exhibit increased refractive indices. Cryolite films, however, do not significantly benefit from IAD. Oxygen, rather than argon, as the bombarding species reduces bombardment-induced absorption in the visible, but may produce an additional oxide absorption edge in the ultraviolet.

40 CHEMISTRY

REFER ALSO TO CITATION(S) 50404

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 49281, 49295, 49959, 49975, 50007, 50183, 50217

49909 **(CONF-871113—2) Drop formation from an orifice in an electric field.** Byers, C.H.; Perona, J.J. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 23p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014405.

From American Institute of Chemical Engineers annual meeting; New York, NY, USA (15 Nov 1987).

The use of an electric field to control the formation of small drops at an orifice in a circular disk was investigated. Water drops were formed in a pure cyclohexane continuous phase, in the prejetting regime using four different orifice diameters. Because of the application of high potentials (up to 1000 V/cm) and because the orifice plate produced a nonuniform field, drop volumes varied to as little as 20 times smaller than the drop volume for a zero-field case. The drops were ellipsoidal in shape, and droplet eccentricity increased dramatically with field intensity. A mathematical model was developed, based on the potential field between a disk (the orifice plate) and an infinite plate (the grounded screen). The electric force on the drop was calculated from the field intensity at discrete points around the periphery. Values for predicted drop volumes using this model and for experimental drop volumes agreed very well. 11 refs., 8 figs.

49910 **(CONF-8709132—1) Liquid secondary ion mass spectrometry of volatile amines.** Todd, P.J. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 3p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000346.

From 6. international conference on secondary ion mass spectrometry - SIMS VI; Versailles, France (13 Sep 1987).

The relationship between an octylamine concentration, primary ion current density and the relative intensity of secondary protonated octylamine peaks in the secondary ion mass spectra of octylamine/glycerol solutions is reported. The relation between the intensity of protonated octylamine and the pressure of octylamine being introduced onto the surface of glycerol that was being irradiated by 5 keV Ar^+ primary ions at constant current density was determined. A second series of experiments was done in which the amine pressure was held constant, and the relative intensity of protonated octylamine was measured at various primary ion current densities. This determined the relation between the relative intensity of protonated octylamine, $[130^+]$, and the primary ion current density at constant pressure. It was possible to extrapolate $[130^+]$ back to the point where the primary ion current density was zero. The surface concentration of octylamine is determined by Henry's Law, octylamine surface activity, and octylamine partial pressure. Henry's Law constants and octylamine surface activity in glycerol were determined separately. The octylamine concentration was calculated from the applied pressure at zero primary ion current density, and the relation between octylamine concentration and secondary protonated octylamine intensity. 3 figs.

49911 **(DOE/ER/60508—1) A study of the physical-chemical mechanisms and variables which affect the transport of inorganic and organic heterogeneous systems: Annual progress report for 1986-1987.** Zeltner, W.A. (Wisconsin Univ., Madison (USA)). 1987. Contract FG02-87ER60508. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000139.

Goal is to investigate the reaction mechanisms and key non-biological variables which affect the partitioning of microcontaminants between aqueous solutions and solid phase adsorbents. The primary technique used is cylindrical internal reflection - Fourier transform infrared (CIR-FTIR) spectroscopy, in conjunction with wet chemical adsorption isotherm and electrophoretic mobility measurements. CIR-FTIR study of the adsorption of phenol, benzoic acid and derivatives on goethite indicated that phenol and o-nitrophenol do not adsorb. Two separate adsorption mechanisms were observed for five other organics: (1) bidentate adsorption; (2) chelate adsorption along crystal edges. Phosphate adsorption was also studied using CIR-FTIR, with a bidentate adsorption mechanism also indicated. Another aspect of this investigation is to determine the effect of possible particle aggregation on adsorption. This aspect requires the use of a Matec Instruments System 8010, which is currently being purchased. 4 refs.

49912 **(IAEA-RL—142) Intercomparison study IAEA/SL-2 on the determination of environmental levels of radioactivity in lake sediment.** LaBrecque, J.J.; Dekner, R.; Hanna, A.N.; Reichel, F.; Rassoul, A.; Schelenz, R. (International Atomic Energy Agency, Vienna (Austria)). Apr 1987. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703410.

The results of the intercomparison on lake sediment (IAEA/SL-2) for the determination of environmental levels of radioactivity are reported. The data from twenty-one laboratories from fifteen countries have been considered and include the determination of the radionuclides /sup 40/K, /sup 90/Sr, /sup 137/Cs, /sup 210/Pb, /sup 226/Ra, /sup 228/Ra, /sup 228/Th, /sup 234/Th, /sup 238/U and /sup 239/240/Pu. According to a rigorous statistical evaluation sufficient data for recommended mean values and confidence intervals only have been received for /sup 40/K and /sup 137/Cs. Figs and tabs.

49913 **(IAEA-RL—146) Status and future trends of Analytical Quality Control Services. Report of the consultants' meeting, Vienna, Austria, 18-21 November 1986.** LaBrecque, J.J.; Schelenz, R.; Hardy, E.P. (International Atomic Energy Agency, Seibersdorf (Austria). Laboratories). Jul 1987. 23p. (CONF-8611188—Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700112.

From Consultants' meeting on status and future trends of Analytical Quality Control Services; Vienna, Austria (18 Nov 1986).

This report reviews the present Analytical Quality Control Services (AQCS) programme components in the light of the needs of IAEA Member States for analytical reference materials and intercomparisons, provides guidelines for the direction which the

programme should take in the future and identifies the type of Analytical Quality Control Services most urgently required by the Member States. Refs, 2 tabs, fig.

49914 (IAEA-TECDOC—409, pp 139-149) **Reactor neutron activation analysis (RNAA).** Rausch, H.; Elek, A.; Oerdoegh, M.; Sziklai, I. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

In the Central Research Institute for Physics the WWR-S type nuclear research reactor has been put into operation in 1959 and the neutron activation analysis was initiated in 1960. The investigation of corrosion and fission products in primary coolants of nuclear power plants, analysis of high purity materials, investigation of biological substances and multielement analysis in geological and rock samples using NAA are described. 13 refs, 5 figs, 3 tabs.

49915 (IAEA-TECDOC—409, pp 269-280) **Neutron activation analysis at the Danish reactor DR3.** Christensen, L.H.; Damsgaard, E. (Risoe National Lab., Roskilde, Denmark). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

Irradiation facilities, counting equipment, and methods of calculation for neutron activation analysis at the Danish reactor DR3 are described. Both neutron activation analysis with radiochemical separation (RNAA) and instrumental activation analysis (INAA) are carried out on a routine basis. 14 refs, 3 figs, 6 tabs.

49916 (IAEA-TECDOC—409, pp 369-377) **Increased utilization of research reactor facilities without personnel expansion by a user-friendly system for routine instrumental neutron activation analysis.** Bode, P.; Bruin, M. de; Korthoven, P.J.M. (Interuniversitair Reactor Inst., Delft, Netherlands). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

In order to exploit with sufficient efficiency an expensive tool as a nuclear research reactor, at the I.R.I. scientists from the applied fields are being encouraged and enabled to include nuclear methods in their own (non-nuclear) research projects. This has extensively been worked out in the IRI-system for routine instrumental neutron activation analysis. This system can be used by guests, without a prior knowledge of activation analysis, after only a short instruction period. By this approach the use of the described analysis system has resulted into a strong increase of the use of the reactor's irradiation facilities without the need for expanding the permanent staff. 8 refs, 3 figs, 3 tabs.

49917 (IAEA-TECDOC—409, pp 379-387) **Organization of a medium throughput neutron activation analysis laboratory for geochemical exploration samples.** Rosenberg, R.J.; Lipponen, M.; Vaenskae, L. (Valtion Teknillinen Tutkimuskeskus, Espoo, Finland). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

Instrumental thermal and epithermal neutron activation analysis can be used for the analysis of 42 different elements in solid geochemical samples. At the Reactor Laboratory about 15,000 samples are analyzed annually by gammaspectrometric activation analysis and 4,000 to 20,000 by delayed neutron counting. The number of element determinations is more than 300,000 annually. The cost per sample varies between US$ 10 and 50 for normal activation analysis and is US$ 2 for delayed neutron counting. In the following the organization of the work now and in the near future is discussed. 8 refs, 4 figs, 1 tab.

49918 (IAEA-TECDOC—409, pp 389-402) **Applied research performed and in progress by using a Triga nuclear reactor.** Moauro, A.; Madaro, M. (ENEA, Casaccia, Italy. Centro Ricerche Energia). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The TRIGA reactor of ENEA Casaccia has been used in different applied research fields among which particularly the following applications of neutron activation analysis (NAA) are reported: a) Environmental. The results are referred to the determination of about 30 microelements in marine suspended particulate matter and sediments. A study was also performed on the impurities of the filters used for environmental studies and an intercomparison was carried out on two sediments distributed by the Joint Research Center, Ispra, Euratom. b) Forensic. Many applications of NAA have been performed in this field on request of Italian Courts for determination of gunshot residues, particularly on paraffin gloves and clothes of person suspected to have handled and/or fired a gun; also the firing distance was determined in some cases. c) Plant nutrition. The uptake of cobalt and zinc has been studied in pot and the tolerance index was established in cooperation with the Istituto di Cerealicoltura Roma. d) Geological. The rare earth concentrations normalized with respect to the chondritic rocks can be utilized for petrogenetic studies and some determinations have been performed both by thermal and epithermal NAA on some rock samples. A program of utilization of the TRIGA reactor in the field of the preparation of a Ir-191m generator has been provided for applications in the pediatric angiography. For this purpose a cooperation with the Clinical Physiology Institute of National Research Council of Pisa has been established. 16 refs, 8 figs, 7 tabs.

49919 (IAEA-TECDOC—409, pp 403-411) **Use of stable activable tracers in environmental and biological research.** Minski, M.J. (Imperial Coll. Reactor Centre, Silwood Park, Ascot, UK). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

Stable tracers have the advantage over radio-tracers in that they can be used in situations where radio-tracers would not be considered acceptable. For example in biological research they can be given to children, pregnant women and volunteers with no risk of radiation and in the environment large quantities can be distributed over an exposed area with no risk to the public. The stable tracers are analyzed by neutron activation using the Imperial College Reactor; the most suitable activable tracers are those having a large activation cross section and a short half life for the radionuclide produced. This gives high sensitivity and enables large numbers of samples to be analyzed in a short time. In certain cases it is useful to enrich the stable isotope and biological work here involves the use of stable enriched /sup 58/Fe to study iron uptake in humans. Current work using stable tracers at the Reactor Centre is both environmental and biological and consists of the following applications: (1) Iron absorption in humans; (2) Dysprosium as a stable tracer in the environment; (3) Stable tracers to investigate uptake of radionuclides released from nuclear power plants. 20 refs.

49920 **(INIS-BR—687) Extraction of zirconium and hafnium thiocyanates by CH/sub 3/COCH/sub 2/CH.(CH/sub 3/)/sub 2/-HSCN solvent from chloride medium.** Okada, A.T. (Sao Paulo Univ. (Brazil)). 1982. 94p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703447.

A zirconium-hafnium separation process for application in nuclear industry is presented. The extraction of zirconium and hafnium thiocyanates in chloride medium by hexone-HSCN solvent was studied. The extraction process was developed, varying the pa-

rameters, such as, concentrations of the metals, the thiocyanate ion, the sulphate ion and free acidity in aqueous phase.

49921 **(INIS-BR—696) Proceedings of the Workshop on Recent Developments in Organic NMR.** (Universidade Estadual de Campinas (Brazil). Inst. de Quimica). 1986. 100p. (In Portuguese). (CONF-8607338—). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456.

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

Some works about application of nuclear magnetic resonance in several aspects are presented. Some structures of effects caused by organic materials in the solid state are shown. The nuclear magnetic resonance characterization in different types of products and determinations of molecular structures are studied. (M.J.C.).

49922 (INIS-BR—696, pp 43) **Applications of Carbon-13 NMR spectroscopy to the analysis of oil seeds.** Seidl, P.R.; Colnago, L.A. (Instituto Militar de Engenharia, Rio de Janeiro, Brazil). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

49923 (INIS-BR—696, pp 44) **Substituent effects of α - heteroatoms stereochemical consequences.** Rittner, R. (Universidade Estadual de Campinas, Brazil. Inst. de Quimica). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

49924 (INIS-BR—696, pp 54) **/sup 13/C NMR spectroscopy in natural products chemistry.** Marsaioli, A.J. (Universidade Estadual de Campinas, Brazil. Inst. de Quimica). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

49925 (INIS-BR—696, pp 66) **Study by /sup 13/C-nuclear magnetic resonance of N-alkyl-2-mercapto-1-alkylamine hydrochlorides.** Veloso, D.P.; Nelson, D.L.; Vieira Filho, S.A. (Minas Gerais Univ., Belo Horizonte, Brazil. Dept. de Quimica). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

49926 (INIS-BR—696, pp 66) **Carbon-13 spectra and molecular motions in a constituent of cashew nut shell liquid.** Bernassau, J.M.; Berfranne, M. (Ecole Polytechnique, 91 - Palaiseau, France; Ceara Univ., Fortaleza, Brasil). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

49927 (INIS-BR—696, pp 66) **Aids in intepreting carbon-13 NMR spectra of substitued exo, endo tetracyclo [6,2,1,1/sup 3/,6,O/sup 2/,7] dodecanes.** Leal, K.Z.; Seidl, P.R.; Costa, V.E.U. (Instituto Militar de Engenharia, Rio de Janeiro, Brazil). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

49928 (INIS-BR—696, pp 69) **/sup 13/C NMR study of 3,4-benzo-2-azabicyclo/3.2.0./ hepta-3,6-dienes and benzazepines.** Rodrigues, J.A.R.; Verardo, L.I. (Universidade Estadual de Campinas, Brazil. Inst. de Quimica). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

49929 **(INIS-BR—740) Precision and accuracy in uranium isotope analysis with thermoionic mass spectrometer - Data acquisition with microcomputer.** Kakazu, M.H.; Sato, K.; Moraes, N. M.P. de; Shihomatsu, H.M.; Iyer, S.S. (Associacao Brasileira de Quimica, Rio de Janeiro). 1986. 1p. (In Portuguese). (CONF-8603206—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703492.

From 1. Latin American meeting on mass spectrometry; Rio de Janeiro, RJ, Brazil (20 Mar 1986).

Published in summary form only.

49930 **(INIS-BR—742) Studies about the efficiency of uranium thermoionization applied to isotope dilution.** Shihomatsu, H.M.; Iyer, S.S. (Associacao Brasileira de Quimica, Rio de Janeiro). 1986. 1p. (In Portuguese). (CONF-8603206—3-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703494.

From 1. Latin American meeting on mass spectrometry; Rio de Janeiro, RJ, Brazil (20 Mar 1986).

Published in Summary form only.

49931 **(INIS-BR—743) Isotope dilution analysis in nuclear fuel materials- Contribution to the international program of intercomparison.** Iyer, S.S.; Kakazu, M.H.; Shihomatsu, H.M.; Sarkis, J.E.; Moraes, N. M.P. de. (Associacao Brasileira de Quimica, Rio de Janeiro). 1986. 1p. (In Portuguese). (CONF-8603206—4-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703495.

From 1. Latin American meeting on mass spectrometry; Rio de Janeiro, RJ, Brazil (20 Mar 1986).

Published in summary form only.

49932 **(INIS-BR—744) Application of mass spectrometers type quadrupole in the determination of residual gas.** Vega, O.; Iyer, S.S. (Associacao Brasileira de Quimica, Rio de Janeiro). 1986. 1p. (In Portuguese). (CONF-8603206—5-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703496.

From 1. Latin American meeting on mass spectrometry; Rio de Janeiro, RJ, Brazil (20 Mar 1986).

Published in summary form only.

49933 **(INIS-BR—768) Bench scale flotation of spodume/quartz and lepidolite/quartz synthetic mixtures.** Valadao, G.E.S.; Gontijo, C.F.; Peres, A.E.C. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 8p. (In Portuguese). (CONF-8510463—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703516.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

Based on results of zeta potential determinations and microflotation tests, bench scale flotation experiments were carried out using spodume/quartz and lepidolite/quartz synthetic mixtures. Pure natural samples, further purified in laboratory, and commercial reagents were employed. The minerals were characterized by X-ray diffraction technique. Selectivity between spodume and quartz was achieved through modification with corn starch and between lepidolite and quartz through pH control in the acidic range.

49934 **(INIS-BR—769) Recovery of primary cassiterite by flotation.** Oliveira, J.F. de; Penna, M.T.M.; Adamian, R. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 10p. (In Portuguese). (CONF-8510463—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703517.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

The flotation of cassiterite ores using samples of primary ore from Pela Ema, Brazil is studied. The cassiterite was characterized by X-ray fluorescence analysis. The samples were submitted to size reduction in order to obtain liberation of cassiterite in excess of 95%. The flotation tests were carried out without desliming. Several collectors and depressants were investigated, as well as the influence of the concentration of these reactants and the pH factor upon flotation of cassiterite. The results were analysed considering the

flotability of the minerals, and the electrophoretic mobility of cassiterite, both in the presence and absence of selected collectors.

49935 **(INIS-BR—832) Quantitative X-ray analysis of pigments.** Araujo, M.M. de. (Associacao Brasileira de Corrosao, Rio de Janeiro). 1987. 12p. (In Portuguese). (CONF-8705180—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703728.

From 14. national seminar of corrosion; Sao Paulo, Brazil (11 May 1987).

The 'matrix-flushing' and the 'adiabatic principle' methods have been applied for the quantitative analysis through X-ray diffraction patterns of pigments and extenders mixtures, frequently used in paint industry. The results obtained have shown the usefulness of these methods, but still ask for improving their accuracy.

49936 **(INIS-BR—857) Evaluation of exploitation alternatives of iron - titanium - vanadium ore from Campo Alegre de Lourdes (Bahia-Brazil).** Cassa, J.C.S.; Ogasawara, T.; Silva, F.T. da; Cuellar, O.D. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 29p. (In Portuguese). (CONF-8705182—5). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703750.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

An evaluation of experiences carried out in order to develop an economic process for vanadium, is presented. The attempts which are being developed in the Metallurgical Engineering Program at COPPE/UFRJ, are described, and the other technical and economical possibilities of existing technologies, are analysed. The advantages and disadvantages of integrated steel making process to recover iron, titanium and vanadium contained in the ore from Campo Alegre de Lourdes deposit, in Bahia-Brazil are considered.

49937 **(INIS-BR—859) Precipitation of vanadium compounds.** Martins, A.H.; Cassa, J.C.S. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 17p. (In Portuguese). (CONF-8705182—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703751.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

The results of a study on the chemistry of the precipitation process of vanadium compounds in sulfuric media are presented, in order to recover the vanadium contained in the ore from Campo Alegre de Lourdes (Bahia-Brazil).

49938 **(INIS-BR—863) Separation of niobium from ferroniobium by chlorination.** Sato, N.; Nanjo, M. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 12p. (CONF-8705182—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703755.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

Separation of niobium from ferroniobium by chlorine metallurgy were investigated. The chlorination of ferroniobium by chlorine gas was carried out under several thermodynamic conditions and the effective conditions were determined. Preliminary separation of niobium pentachloride from ferric chloride is possible by selective condensation with temperature gradient techniques. Selective reduction of ferric chloride to ferrous chloride by iron powder was done to separate niobium pentachloride by their volatility difference. Separation of niobium pentachloride from ferric chloride using organic solvent was tested. The niobium pentachloride with high purity could be separated effectively from ferroniobium chlorides by selective reduction of ferric chloride and selective dissolution of niobium pentachloride in organic solvent. A new dry process which has the possibility of industrial application is presented. (Author.

49939 **(INIS-mf—10954) Consultants' group meeting on stable isotope reference samples for geochemical and hydrological investigations.** Hut, G. (International Atomic Energy Agency, Vienna (Austria)). Apr 1987. 42p. (CONF-8509408—). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703554.

From Consultants' group meeting on stable isotope reference samples for geochemical and hydrological investigations; Vienna, Austria (16 Sep 1985).

The results of the intercomparison on stable isotope reference samples for the determination of isotope ratio are reported. The data from twenty-five laboratories from fourteen countries have been considered and include the determination of the stable isotopes /sup 2/H, /sup 13/C, /sup 18/O and /sup 34/S. There were no samples distributed to determine /sup 15/N values, but the difficulty is discussed encountered in the use of air nitrogen as a standard and the influence of argon contents in nitrogen gas samples on /sup 15/N values measured. Refs, figs and tabs.

49940 (INIS-mf—10998, pp 8) **Weak hydrogen bonding in some chlorometallates.** James, B.D. (La Trobe Univ., Bundoora, Australia). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

49941 (INIS-mf—10998, pp 9) **Electrical ordering in the alkali hydroxides.** Bastow, T.J. (Commonwealth Scientific and Industrial Research Organization, Clayton, Australia. Div. of Chemical Physics). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

49942 (INIS-mf—10998, pp 13) **Transition-metal hydride complexes: characterisation and role in catalysis.** Robertson, G.B. (Australian National Univ., Canberra. Research School of Chemistry). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

49943 (INIS-mf—10998, pp 14) **Determination of hydrogen content by polarization analysis.** Osborn, J.C.; Hicks, T.J.; Hill, R.J. (Monash Univ., Clayton, Australia. Dept. of Physics; Commonwealth Scientific and Industrial Research Organization, Port Melbourne, Australia. Div. of Mineral Chemistry). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

49944 (INIS-mf—10998, pp 16) **Thermal phase transformations in sodium sulphate and sodium chromate.** Nimmo, J.K. (Queensland Univ., St. Lucia, Australia. Dept. of Physics). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

49945 **(MLM—3455(OP)) Comparison of calculated and experimental powder x-ray diffraction patterns of organic materials.** Cantrell, J.S.; Beiter, T.A.; Sullenger, D.B. (Miami Univ., Oxford, OH (USA). Dept. of Chemistry; Monsanto Research Corp., Miamisburg, OH (USA). Mound). 1987. Contract AC04-76DP00053. 6p. (CONF-8708150—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000729.

From 36. annual Denver X-ray conference; Denver, CO, USA (3 Aug 1987).

The Powder Data File (PDF) contains far fewer organic entries than inorganic ones despite the existence of many more organic compounds. The ready availability of many of the missing organic substances affords their potential inclusion via quality experimental patterns. Considerable expansion of the organic portion of the PDF is also available via computation from the extensive published single crystal literature. Careful comparison of calculated and experimental patterns can be quite useful in resolving problems encounter in patterns from each source and in more fully characterizing "real-life" materials. Examples of this interplay are presented, featuring, particularly, explosive compounds, an especially sparsely populated portion of the PDF.

49946 **Correction of fluorescence detected circular dichroic photoselection artifacts using light collecting ellipsoidal mirrors.** Bicknese, S.E.; Maestre, M.F. (Department of Biophysics, University of California, Berkeley, California 94720). *Review of Scientific Instruments;* **58**: No. 11, 2060-2063(Nov 1987).

Ellipsoidal mirrors are used to collect the emitted light from fluorophores in fluorescence detected circular dichroic (FDCD) measurements and to deliver this light to a photomultiplier tube (PMT) at 90° to the excitation beam. These mirrors collect light over a symmetrical 71% of the emission sphere centered on the sample cell, and thereby eliminate most of the nonuniformity in detected emission resulting from the anisotropy of photoselection. Furthermore, even with reflectance and path length losses, the amount of fluorescent emission reaching the PMT is increased by a factor of approximately 18. Elimination of photoselection artifacts in UV FDCD spectra is demonstrated by comparing spectra of L-tryptophan in glycerol with its spectra in water. Validity of the values measured is verified through calibration with a d10 camphorsulfonic acid (d10 CSA) standard.

49947 **Diffuse reflectance and photoacoustic Fourier transform infrared spectra of silica surfaces under polarizable gases.** Story, W.C.; Masujima, T.; Liang, J.; Liu, G.; Eyring, E.M.; Harris, J.M.; Anderson, L.L. (Department of Chemistry, University of Utah, Salt Lake City, Utah 84112). *Applied Spectroscopy;* **41**: No. 7, 1156-1159(Sep 1987).

It has been reported that the use of an infrared transparent polarizable gas such as xenon enhances the FT-IR photoacoustic signal of some species adsorbed on a sample surface. Diffuse reflectance and photoacoustic FT-IR methods were used to obtain spectra of silica surfaces under helium, nitrogen, and xenon. Absence of the reported effect with both techniques is shown, and a tentative explanation for these results is given.

49948 **Enhanced room-temperature phosphorescence of anthracene on cyclodextrin-treated filter paper.** Vo-Dinh, T.; Alak, A. (Advanced Monitoring Development Group, Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6101). *Applied Spectroscopy;* **41**: No. 6, 963-965(Aug 1987). Contract AC05-84OR21400.

This study investigates the enhancement of room-temperature phosphorescence (RTP) for anthracene when the compound is adsorbed on cyclodextrin (CD)-treated filter paper. The results show that β-CD treatment induces a significant increase in anthracene RTP emission, which is normally extremely weak. The α-CD does not produce any strong RTP enhancement, while γ-CD produces relatively lower enhancement than does β-CD. The CD treatment procedure is very simple and improves the analytical usefulness of the RTP method. The binding constants of anthracene to cyclodextrin were measured with the use of thin-layer chromatographic retention values. Anthracene has a higher binding constant with β-CD than with γ-CD, in agreement with the RTP enhancement results.

49949 **Investigation of experimental parameters for surface-enhanced Raman scattering (SERS) using silver-coated microsphere substrates.** Moody, R.L.; Vo-Dinh, T.; Fletcher, W.H. (Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831 (R.L.M., T.V.-D.); Chemistry Department, Univeristy of Tennessee, Knoxville, Tennessee 37919 (W.H.F.)). *Applied Spectroscopy;* **41**: No. 6, 966-969(Aug 1987). Contract AC05-84OR21400.

The effects of experimental parameters on surface-enhanced Raman scattering (SERS) for silver-coated microsphere substrates were investigated. The parameters included sphere size, silver thickness, and excitation wavelength. The SERS signal intensity varied as each of these parameters was changed. The potential for increasing SERS sensitivity was illustrated by the detection of benzo(a)pyrene, a molecule of environmental and toxicological interest, at a concentration well below that possible for normal Raman scattering. This work describes some optimization procedures and demonstrates the possibility for further improving SERS enhancement of these silver-coated microsphere substrates by optimizing experimental parameters.

49950 **Automatic titrator for high precision plutonium assay.** Jackson, D.D.; Hollen, R.M. (Los Alamos National Lab., NM). pp vp of Nuclear safeguards technology 1986. Proceedings of an international symposium on nuclear material safeguards held in Vienna, 10-14 November 1986. Vienna, Austria; IAEA (1987). (CONF-861104—).

From International symposium on nuclear material safeguards; Vienna, Austria (10 Nov 1986).

Highly precise assay of plutonium is required for accountability measurements. The authors have developed an automatic titrator for this determination which eliminates analyst bias and requires much less analyst time. The analyst is only required to enter sample data and start the titration. The automated instrument titrates the sample, locates the end point and prints the results on paper tape. The precision of titration is less than 0.03% relative standard deviation for a single determination at the 250 mg of plutonium level. The titration time is less than 5 min. 2 references.

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REFER ALSO TO CITATION(S) 49281, 49338, 49399, 49472, 49561, 49584, 49642, 49671, 49865, 50391, 50392, 50393, 50588, 50775, 50782

49951 **(BNL—40183) The role of electronic structure calculation in mechanistic analysis of electron transfer reactions in the liquid phase.** Newton, M.D. (Brookhaven National Lab., Upton, NY (USA)). Aug 1987. Contract AC02-76CH00016. 16p. (CONF-8709136—1). NTIS, PC A02. File Number DE87014395.

From Chemical reactions in the liquid state center for computational chemistry workshop; Orsay, France (7 Sep 1987).

Model calculations have been employed in elucidating the mechanism of electron transfer reactions in aqueous solution. The contribution of inner shell OH bonds to activation barriers has been estimated from calculation for metal ion hydrates. Calculated electron transfer matrix elements (H/sub if/) for redox processes of the type, $ML_6^{2+} + ML_6^{3+} \rightleftharpoons ML_6^{3+} + ML_6^{2+}$, M = Fe, Co, or Ru, L = H_2O or NH_3, have been analyzed in terms of various orbital concepts. The matrix elements are based on ab initio wavefunctions for model supermolecule clusters of the type, (ML/sub n/...L/sub n/M)$^{5+}$, with n = 1 or 3. The analysis shows that the many-electron H/sub if/ quantities can in fact be expressed to good approximation as effective 1-electron expressions of the type, H/sub if/ proportional to $\lambda')^2$N/sub c/h/sub LlLr/, where λ' is the metal-ligand covalency parameter, h/sub LlLr/ is a local 1-electron matrix element for ligand orbitals in contact in the transition state, and N/sub c/ is the number of such contacts. A least-squares fit of the data implies a value of $\sim$5000 cm^{-1} for h/sub LlLr/, showing that significant coupling can occur in the absence of formal bonding between reactants. 23 refs., 6 figs., 2 tabs.

49952 **(DP-MS—86-200) The reaction of diiodoethane with neptunium and plutonium metals.** Karraker, D.G. (Savannah River Lab., Aiken, SC (USA)). Apr 1987. Contract AC09-76SR00001. 10p. (CONF-870443—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012943.

From 2. international conference on the basic and applied chemistry of f-transition (lanthanides and actinides) and related elements; Lisbon, Portugal (6 Apr 1987).

Neptunium, plutonium, lanthanum, praseodymium, and neodymium metals react with diiodoethane to yield tetrahydrofuran (THF) solvated iodides, MI. xTHF (M = Np, Pu, La, Pr, or Nd; x = 3, 4, or 5). Np metal also reacts with diiodopropane; samarium metal reacts with diiodobutane and o-diiodobenzene as well to produce SmI . 2THF. A comparison of the infrared spectra of SmI .·2THF and NpI_3 . 4THF was interpreted as showing interference with the normal vibrational modes in the coordinated THF of the trivalent iodides. The trivalent products are slightly soluble in THF, and the Np^{3+} compound reacted rapidly with T1MeCp to form either $NpI_2(MeCp)$. 3THF or $NpI(MeCp)_2$. 3THF. A possible advantage in synthesis is discussed. 7 refs., 2 figs., 1 tab.

49953 **(INIS-BR—703) Deuterium secondary isotope kinetic effects in imine formation reactions.** Amaral, L. do; Rossi, M.H. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 9p. (In Portuguese). (CONF-8611184—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703694.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

The kinetic α-deuterium isotope effects, K/sub D//K/sub H/, for reaction mechanisms is studied. The reaction of pH function to m-bromobenzaldehyde, semicarbazide nucleophile, methoxyamine and hydroxylamine are analysed. (M.J.C.).

49954 **(INIS-BR—776) Aspects of reduction clorination of pyrochlore concentrates.** Gameiro, D.H.; Brocchi, E.A. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 13p. (In Portuguese). (CONF-8510463—14). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703702.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

Reduction chlorination experiments were carried out with two different Brazilian pyrochlore concentrates in order to evaluate the effects of some variables on the extent of niobium pentoxide gasification as well as to compare the behavior of concentrate under the same chlorination conditions. The pyrochlore concentrates from Araxa (MG) and Catalao (GO), Brazil, were submitted to X ray diffraction and X ray fluorescence analysis for determining their chemical compositions. Kinetic curves were obtained with the main variables being temperature and percentage of reducing agent. Analysis of the condensed material in terms of Nb/sub 2/O/sub 5/ indicated that chlorination can be used to produce niobium pentoxide.

49955 **(INIS-BR—777) Solubility products of tungstates, titanates and aluminates from 25°C to 200°C.** Teixeira, L.A.C. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 7p. (In Portuguese). (CONF-8510463—12). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703524.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

The solubility products of several complex oxides (tungstates, aluminates, and titanates) were calculated from thermodynamic data, in the range 25 - 200°C, using a computer program. High temperature entropy for ionic species was determined using the entropy correspondence principle.

49956 **(INIS-BR—778) Solvent extraction of zirconium and hafnium using MIBK-HSCN-HCL process.** Borges, J.A.L.; Cunha, O.G.C. da. (Rio Grande do Norte Univ., Natal (Brazil)). 1985. 5p. (In Portuguese). (CONF-8510463—13). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703525.

From 11. national meeting of mineral treatment and hydrometallurgy; Natal, RN, Brazil (23 Oct 1985).

The separation process of zirconium and hafnium, using MIBK as extractant in a set of mixer-settler is described. The chemical analysis was done by X-ray fluorescence and emission spectrography.

49957 **(INIS-BR—855) Eh-pH diagrams of the V-H/sub 2/O system at 25,60 and 100/sup 0/C.** Silva, F.T. da; Ogasawara, T.; Cassa, J.C.S. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 20p. (In Portuguese). (CONF-8705182—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703748.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

Free energies of the formation of vanadium ions in aqueous solutions at elevated temperatures were determined. Eh-pH diagrams at 25/sup 0/C, 60/sup 0/C and 100/sup 0/C at different vanadium concentrations, using microcomputers were calculated and obtained. The effects of temperature and vanadium concentration on the predominance of vanadium species were examined. The Eh-pH diagrams for the V-H/sub 2/O system were evaluated by comparisons with experimental data.

49958 **(INIS-BR—858) Preparation of potassium tantalum fluoride from tantalum hydroxide.** Silva, F.T. da; Espinola, A.; Dutra, A.J.B. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 16p. (In Portuguese). (CONF-8705182—12). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700027.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

Potassium tantalum fluoride (K/sub 2/TaF/sub 7/) is an intermediary product in the processing of tantaliferous materials; it is the basic raw material for both reduction processes in use presently: reduction by metallic sodium and electrolysis in molten halides. It is normally obtained from a fluorotantalic acid solution to which potassium ions are added the precipitation of white acicular crystals of K/sub 2/TaF/sub 7/. The conditions for precipitation and recrystallization were studied, and crystal characterization were done by scanning electron microscopy, X-ray diffraction and thermogravimetric and thermodifferential analyses.

49959 **(INIS-BR—864) Kinetic of the reductive chlorination of niobium pentoxide contained in a tin-bearing slag.** Moura, F.J.; Brocchi, E.A.; Kohler, H.M. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1987. 17p. (In Portuguese). (CONF-8705182—11). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703756.

From 2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy; Rio de Janeiro, Brazil (25 May 1987).

Chlorination experiences were carried out with a tin-bearing slag, using charcoal as reducing agent, aiming to develop a mathematical model to represent the kinetic of niobium pentoxide gasification. The results show a discrete effect for the initial percentage of reducing agent, when it is compared with the temperature influence. The kinetic curves obtained by the mathematical equation present excellent agreement with experimental results. (M.C.K.).

49960 (INIS-SU—423, pp 150-151) **Coefficients of thermal expansion of alkali metal iodide solutions in dimethylsulfoxide.** Kozlov, I.L.; Novoselov, N.P. 1986. (In Russian). NTIS (US Sales Only), PC A11/MF A01. File Number DE87780174. (CONF-8606301—Pt.1-Summs.).

From 11. All-Union conference on calorimetry and chemical thermodynamics; Novosibirsk, USSR (17 Jun 1986).

49961 (IWGFPT—25, pp 17-23) **High temperature thermodynamic properties of the fission product compounds of cesium and rubidium.** Kohli, R.; Lacom, W. (Battelle Columbus Div., OH, USA. Nuclear Technology Section; Oesterreichisches Forschungszentrum Seibersdorf GmbH, Institut fuer Werkstofftechnologie). Oct 1986. NTIS (US Sales Only), PC A09/MF A01. File Number DE88700057. (CONF-8511144—).

From IAEA international symposium on fuel rod internal chemistry and fission product behavior; Karlsruhe, F.R. Germany (11 Nov 1985).

A variety of fission product chemical interactions occurs in the complex fuel/fission products/cladding system in a reactor fuel rod. Of these, the reactions of the chemically active, high yield, volatile fission products, cesium and rubidium, are of particular interest. To understand their chemistry, high temperature thermodynamic data are needed for various compounds of cesium and rubidium. An experimental research program has been initiated to obtain reliable thermodynamic data on various Cs and Rb compounds. To date, heat capacity measurements have been made on Cs and Rb chromates, molybdates, dichromate, dimolybdates and rubidium zirconate in the temperature range 300-800 K. In addition, measurements are currently in progress on Cs and Rb chalcogenides, halides, aluminates and silicates. The measured heat capacity data has been combined with published enthalpy and entropy values to obtain a complete set of thermodynamic functions for some of these compounds to 800 K. The data have been used to reanalyze the chemical state of irradiated UO/sub 2/ fuel and the chemistry of PCI failure of the cladding by halogen stress corrosion cracking of Zircaloy in Light Water Reactors (LWRs). 27 refs, 6 tabs.

49962 (JAERI-M—86-189, pp 261-274) **Brief description of experimental apparatus for hydrogen isotope separation by cryogenic distillation.** Yamanishi, Toshihiko. (Japan Atomic Energy Research Inst., Naka, Ibaraki. Naka Fusion Research Establishment). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

A design study has been performed for an experimental apparatus for hydrogen isotope separation by cryogenic distillation. The experimental apparatus handles hydrogen isotope mixture of all six molecular species (H/sub 2/, HD, HT, D/sub 2/, DT and T/sub 2/). The major items in the design study are to draw a flow schematic of the system, to determine the structures of the components and to examine operation and control modes.

49963 (JAERI-M—86-189, pp 237-239) **Hydrogen isotope (tritium) separation by infrared multiple-photon dissociation.** Yokoyama, A.; Suzuki, K.; Fujisawa, G.; Ishikawa, N. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

The tritium removal from waste water based on the irotropically selective multiple-photon dissociation of CTCl/sub 3/ can be accomplished through two successive processes: tritium transfer process from water to chloroform, and laser tritium separation process. When a mixture of CTCl/sub 3/ and CHCl/sub 3/ is irradiated with 816, 828 and 833 cm/sup -1/ radiations from a CO/sub 2/ laser pumped NH/sub 3/ laser, CTCl/sub 3/ is decomposed selectively. The decomposition of CHCl/sub 3/ is not seen even after 10000 laser pulses irradiation. The single-step tritium enrichment factor in photo-products produced by one laser pulse irradiation, which is defined as the ratio of the T/H fraction in the photoproducts to that in the initial chloroform, is found to be greater than 570 at chloroform pressure of 2 toor. The laser fluence required for the decomposition of every CTCl/sub 3/ molecule, or saturation fluence, is about 28 J/cm/sup 2/ at 2 torr. The saturation fluence increases with chloroform pressure as a result of energy transfer from excited CTCl/sub 3/ to CHCl/sub 3/ within a laser pulse duration. Therefore, a shorter pulse laser is necessary for the laser T/H separation at higher chloroform pressure. Under the coexistence of water and chloroform phases, tritium exchange reaction between chloroform and water proceeds predominantly. The exchange rates are measured at different hydroxide-ion concentrations, mole ratios of chloroform to water, and reaction temperatures. Since the isotopic fraction factor, defined as the ratio of the T/H fraction in the chloroform to that in the water, is larger than unity, the tritium is enriched in chloroform. (Nogami, K.).

49964 (PSD—87, pp A4) **First-principles tight-binding electronic structure calculations of point defects in silicon.** Sob, M.; Jepsen, O.; Andersen, O.K.; Beeler, F.; Bloechl, P. (Max-Planck-Institut fuer Festkoerperforschung, Stuttgart, Germany, F.R.). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

49965 (PSD—87, pp E8) **Combined investigations of Al-Ni alloys by means of X-ray photoelectron spectroscopy - Compton gamma scattering and positron annihilation.** Hoppe, W.; Marx, U.; Dlubek, G.; Bruemmer, O. (Akademie der Wissenschaften der DDR, Frankfurt/Oder. Inst. fuer Halbleiterphysik; Martin-Luther-Universitaet Halle-Wittenberg, Halle, German Democratic Republic. Sektion Physik). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

49966 **Time-dependent self-consistent field (TDSCF) approximation for a reaction coordinate coupled to a harmonic bath: Single and multiple configuration treatments.** Makri, N.; Miller, W.H. (Department of Chemistry, University of California, and Materials and Chemical Sciences Division, Lawrence Berkeley Laboratory, Berkeley, California 94720). *Journal of Chemical Physics;* **87**: No. 10, 5781-5787(15 Nov 1987). Contract AC03-76SF00098.

This paper explores the usefulness of the time-dependent self-consistent field (TDSCF) approximation for treating the dynamics of a reaction coordinate coupled to a bath of harmonic degrees of freedom. The reaction coordinate is a one-dimensional double well potential, typical of a hydrogen atom isomerization process. The standard (i.e., one configuration) TDSCF approximation is found to provide a very poor description of the effect of coupling to the bath on the isomerization rate. A multiconfiguration (MC-TDSCF) treatment is thus developed and found to provide a much improved description.

49967 **Reaction—diffusion dynamics in inhomogeneous systems.** Ohtsuki, T.; Keyes, T. (Department of Chemistry, Boston University, Boston, Massachusetts 02215). *Journal of Chemical Physics;* **87**: No. 10, 6060-6065(15 Nov 1987).

The macroscopic behavior of reaction—diffusion systems in inhomogeneous media is investigated theoretically. The phenomenological reaction—diffusion equation describing spatial and temporal evolution of the coarse-grained density is derived for systems where reactions take place only on the surface or in the inside of spherical static catalysts immersed dilutely. General cases of one-component reactions and two examples, X+Y→products and Xarrow-right-leftY, Y+Y→ products, of multi(two)-component systems are considered. It becomes evident that in general, the phenomenological reaction—diffusion equation has a different functional form from that of the microscopic reaction—diffusion equation. In addition, it should be emphasized that accordingly as D→∞ or D→0, where D is a diffusion coefficient of reactants, the process exhibits two asymptotic behaviors, the reaction-controlled behavior and the diffusion-controlled behavior. In the reaction-controlled region, the system is homogenous on a macroscopic scale and the density dependence of the phenomenological equation is identical to that of the microscopic equation. In

49968 **Reactive scattering from double minimum potentials: Li^+ catalyzed elimination reactions of alkyl halides.** Creasy, W.R.; Farrar, J.M. (Department of Chemistry, University of Rochester, Rochester, New York 14627). *Journal of Chemical Physics;* **87**: No. 9, 5280-5293(1 Nov 1987).

We present a study of the dehydrohalogenation reactions of Li^+ with isopropyl chloride (IPC), n-propyl chloride (NPC), and isopropyl bromide (IPB) over the collision energy range from 0.6 to 1.7 eV. Full differential cross sections at collision energies up to 1.2 eV show increasing asymmetry in the angular distributions as a function of initial collision energy and suggest that the reactions take place on a time scale of 0.2 ps. The observation of Li^+ nonreactively ejected from the initial encounter complex formed by approaching reactants is consistent with a double minimum reaction coordinate and a comparison of the nonreactive flux with the flux for elimination products allows an estimate of the heights of intermediate isomerization barriers separating the wells on the potential surface. The barrier heights are in the order IPC<IPB<NPC, consistent with a transition state at the isomerization barrier in which a significant charge has developed on the carbon attached to the halogen. The kinetic energy distributions for $Li^+(HX)$ and $Li^+(C_3H_6)$ products and nonreactively scattered Li^+ are in reasonable agreement with phase space theory calculations which include all product vibrational modes. The energy dependence of the $Li^+(HX)/Li^+(C_3H_6)$ branching ratio can be accounted for quantitatively by statistical calculations which include the increasing importance of dissociation of the products with increasing collision energy. The discrepancy between the statistical recoil energy distributions and apparent complex lifetimes several orders of magnitude shorter than the predictions of RRKM theory can be understood in terms of incomplete transfer of energy from the incident Li^+ to the internal degrees of freedom of the initial encounter complex, resulting in a density of complex states much lower than statistical.

49969 **Laser induced fluorescence study of the B-italic-tilde $^2B_2 \rightarrow X\ ^2A_2$ transition of the furan cation in a supersonic free jet expansion.** Smith, R.S.; Anselment, M.; DiMauro, L.F.; Frye, J.M.; Sears, T.J. (Department of Physics, Louisiana State University, Baton Rouge, Louisiana 70803). *Journal of Chemical Physics;* **87**: No. 8, 4435-4446(15 Oct 1987).

The first experimental observation of laser induced fluorescence from the furan cation, $C_4H_4O^+$, is reported. The ion is formed in a supersonic free jet via a two photon ionization involving the 193 nm output of an ArF excimer laser. The B-italic-tilde→X electronic transition is probed and vibrational assignments are presented for both states. Comparisons to the infrared, Raman, multiphoton ionization, and photoelectron spectrum of the parent molecule are made. The term value T_{00} for the B-italic-tilde→X electronic transition is located at 24 675 cm^{-1}, which differs drastically with previously reported values from both experimental and theoretical investigations. These differences are discussed and probable explanations proposed. The lifetime of the vibrationless level of the B-italic-tilde state is measured to be 330 ns.

49970 **Unimolecular dissociation of energy-selected methyl formate ion.** Nishimura, T.; Zha, Q.; Meisels, G.G. (Department of Chemistry, University of Nebraska, Lincoln, Nebraska 68588-0312). *Journal of Chemical Physics;* **87**: No. 8, 4589-4597(15 Oct 1987).

Fragmentation mechanisms of the methyl formate and methyl formate-d_1 ions have been investigated using threshold photoelectron—photoion coincidence (TPEPICO) mass spectrometry. The breakdown diagrams and ion kinetic energies of fragment ions were measured at internal energies of the molecular ion from 0 to 7 eV, and fragmentation pathways were elucidated. The formation of HCO^+ showed a large kinetic isotope effect. The formation of CH_3O^+ from methyl formate-d_1 is accompanied by a large kinetic energy release, about twice that calculated using quasiequilibrium theory (QET). Its relative abundance in the breakdown curve also appears to be inconsistent with statistical theory. Direct dissociation from an isolated state of the molecular ion was one possible explanation. Slow dissociations were observed for the formation of methanol ions resulting from a migration of the formyl hydrogen while QET predicts no metastable dissociation for this process. Two-component reaction rates for methanol ion formation suggest participation of more than one state or isomer. The heat of formation of HCOO was found to be -40 +- 6 kcal/mol, indicating that it is less stable than COOH (ΔH/sub f/ = -58+4 kcal/mol).

49971 **Method of forming clathrate ice.** Hino, T.; Gorski, A.J. (to Dept. of Energy, Washington, DC). US Patent 4,686,833. 18 Aug 1987. Filed date 28 Jul 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A method is described of forming ice in a supercooled water-based clathrate liquid contained in a vessel comprising the steps of: locating an oscillator device having an oscillator plate in the liquid in the vessel; and oscillating the oscillator plate, ultrasonically to produce cavities in the liquid behind the plate thereby forming small crystals of clathrate in the liquid surrounding the cavities, which crystals serve as seed crystals for ice formation in the liquid.

49972 **Method of synthesizing a plurality of reactants and producing thin films of electro-optically active transition metal oxides.** Tracy, C.E.; Benson, D.K.; Ruth, M.R. (to Dept. of Energy, Washington, DC). US Patent 4,687,560. 18 Aug 1987. Filed date 16 Aug 1985. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A method is described of synthesizing thin films of electro-optically active transition metal oxides from a plurality of reactants in a reaction chamber, the process comprising the steps of: (a) inserting a first reactant into the chamber; (b) imparting second transition metal-bearing and third oxygen-bearing reactants into the chamber, the vapor pressures of the first, second and third reactants being effective for establishing a system pressure substantially less than atmospheric pressure; and (c) inducing a plasma reaction among the reactants by plasma depositions, which plasma reaction consolidates the reactants, oxidizes the transition metal-bearing reactants and produces the thin films of electro-optically active transition metal oxides.

49973 **Isotopic exchange in mineral-fluid systems. II. Oxygen and hydrogen isotopic investigation of the experimental basalt-seawater system.** Cole, D.R.; Mottl, M.J.; Ohmoto, Hiroshi. (Oak Ridge National Lab., TN, USA; Hawaii Univ., Honolulu, USA. Hawaii Inst. of Geophysics; Pennsylvania State Univ., University Park, USA. Dept. of Geosciences). *Geochimica et Cosmochimica Acta;* **51**: No. 6, 1523-1538(Jun 1987).

The starting basalts varied in the crystallinity (from holocrystalline to glass) but were ground to approximately the same grain size (-100 mesh). The water/rock mass ratios ranged from 1 to 3, and the duration of the experiments ranged from 167 to 576 days. In general, depletion of ^{18}O and enrichment of D in basalts occur at all temperatures, with the magnitudes of change being greater as temperature, time, and to a lesser degree, glass content increases. The trends in isotopic shifts are directly related to changes in the style and intensity of mineralogic alterations in the basalt (e.g. smectite at 300°C, talc-actinolite at 400°C-500°C). The changes in the delta^{18}O values of basalts and seawater in the experimental systems were observed to follow closely with those expected from a first-order rate law. An application of our experimental rate data to natural systems suggests that the oxygen isotope equilibrium between basalt and seawater in the mid-oceanic ridge may take place within approximately 1000 years at 350°C. Our experimental data also suggest the equilibrium oxygen isotopic fractionation factors between the altered basalt and seawater to be 3.5 +- 0.5% at 300°C, 2.0 +- 0.4% at 400°C, and 0.5 +- 0.25% at 500°C. The observed hydrogen isotopic fractionation factors between the altered basalts and seawater in our experimental systems were about -74% at 300°C, about -62% at 400°C, and about -48%at 500°C. These fractionation factors are probably attributable to the equilibrium fractionation between Fe-rich secondary phases and seawater.

49974 **Electrolytic separation of selenium isotopes from proton irradiated RbBr targets.** Phillips, D.R.; Moody, D.C.; Taylor, W.A.; Segura, N.J.; Pate, B.D. (Los Alamos National Lab., NM, USA; TRIUMF, Vancouver, British Columbia, Canada). *Applied Radiation and Isotopes;* **38**: No. 7, 521-525(1987).

An electrochemical method has been developed to separate selenium isotopes from the spallation products induced in RbBr targets by 800-MeV protons. The selenium isotopes were electrolytically deposited as copper(I) selenide at the surface of a platinum

gauze electrode. The copper(I) selenide was then chemically stripped from the electrode in an oxidizing acid environment. This solution was evaporated to soft dryness. The condensate was brought up in 0.1 F HCl and passed through a cation exchange column. Recoveries of better than 80% were obtained.

49975 **Application of collinear laser spectroscopy on fast atom beams to measure nuclear properties.** Bingham, C.R.; Bounds, J.A.; Carter, H.K.; Mlekodaj, R.L.; Griffin, J.C.; Fairbank, W.M. Jr. (Dept. of Physics, Univ. of Tennessee, Knoxville, TN 37996). pp 426-430 of Electromagnetic isotope separators and techniques related to their applications. Talbert, W.L. New York, NY; Elsevier Science Pub. Co. Inc. (1987). (CONF-860815—).

From 11. international conference on electromagnetic isotope separators and techniques related to their applications; Los Alamos, NM, USA (18 Aug 1986).

A laser spectroscopy system has been developed to observe on-line the atomic hyperfine structure of nuclides provided by heavy-ion collisions and formed into a monoenergetic beam with an isotope accelerator. The system has been used to observe the hyperfine structure and isotope shifts of /sup 189-194,201,203,205/Tl. The authors present here a brief description of the system and discuss its performance characteristics in these initial experiments.

49976 **Selective photoionization of /sup 64/Cu in the presence of /sup 63,65/Cu.** Engleman, R. Jr.; Keller, R.A.; Miller, M.; Nogar, N.S.; Paisner, J.A. (Los Alamos National Lab., Los Alamos, NM 87545). pp 448-451 of Electromagnetic isotope separators and techniques related to their applications. Talbert, W.L. New York, NY; Elsevier Science Pub. Co. Inc. (1987). (CONF-860815—).

From 11. international conference on electromagnetic isotope separators and techniques related to their applications; Los Alamos, NM, USA (18 Aug 1986).

It has been prepared that a copper crystal enriched in /sup 64/Cu relative to /sup 63/Cu would provide a source of a low-energy, monoenergetic beam of positrons, with an intensity as much as three orders of magnitude greater than unenriched sources. The authors have evaluated the use of resonance ionization to selectively photoionize /sup 64/Cu in the presence of the stable isotopes / sup 63/Cu and /sup 65/Cu. It appears that this method may be applied with high selectivity and relatively high efficiency using rather simple laser systems. Various aspects of this technique are discussed.

49977 **Stable isotope enrichment techniques and ORNL separation status.** Tracy, J.G.; Bell, W.A.; Veach, A.M.; Caudill, H.H.; Milton, H.T. (Operations Div., Oak Ridge National Lab., Oak Ridge, TN 37831). pp 7-11 of Electromagnetic isotope separators and techniques related to their applications. Talbert, W.L. New York, NY; Elsevier Science Pub. Co. Inc. (1987). (CONF-860815—). Contract AC05-84OR21400.

From 11. international conference on electromagnetic isotope separators and techniques related to their applications; Los Alamos, NM, USA (18 Aug 1986).

The isotope separation program is described, emphasizing present state-of-the-art techniques utilized to achieve specific isotopic requirements. An interesting problem addressed here is the calutron enrichment of rare-earth isotopes where small quantities of feed (<5g) are available, and the unresolved feed is to be recovered and recycled. Conventional ion-source units using graphite and stainless steel deteriorate in the halogenating atmosphere or are permeable to rare-earth compounds, reducing the process efficiency. An ion source has been developed using boron nitride for containing the halogenating agent and rare-earth compounds. Tests have been successfully conducted using Lu/sub 2/O/sub 3/ and the in situ chlorinating technique with CCl/sub 4/. Collectively, 166 mg of /sup 176/Lu were recovered from two runs using 2.95 and 1.10 g of 44.5% /sup 176/Lu. Process efficiency of 10.5% was achieved, and 1.2 g of the unresolved feed were recovered. Material compatibility of the boron nitride, carbon tetrachloride, and lutetium compounds has been established.

49978 **Experimental investigation of synthesis gas solubility in Fischer-Tropsch reactor slurry.** Huang, S.H.; Lin, H.M.; Chao, K.C. New York, NY; American Institute of Chemical Engineers (1987). 19p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 22C.

A semi-flow apparatus has been designed and constructed for investigation of the phase equilibrium behavior of synthesis gas and products in Fischer-Tropsch slurry reactor. The apparatus provides contact for a flowing gas stream with a stationary liquid and is suited for the determination of gas solubility in a molten wax of high melting point. To verify attainment of equilibrium, the new apparatus has been tested with a mixture of carbon dioxide and toluene. The test data agree well with the experimental results of Ng and Robinson from a static apparatus. Measurement has been completed for the solubility of hydrogen and of carbon monoxide in n-eicosane, n-octacosane, and in n-hexatriacontane at three temperatures (100, 200, and 300°C) and five pressures (10, 20, 30, 40, and 50 atm). Solubility of synthesis gas mixtures of H/sub 2/ and CO in n-octacosane was also determined at three gas compositions and two temperatures (200 and 300°C) for each gas mixture.

49979 **A new method for measuring fluid densities using the Taylor dispersion experiment.** Matthews, M.A.; Rodden, J.B.; Akgerman, A. New York, NY; American Institute of Chemical Engineers (1987). 19p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 20D.

The density of a pure fluid or a fluid mixture is of fundamental importance in the development of equations of state and in design of chemical processes. A new experimental technique (called the flow tracer method) for measuring fluid densities is proposed and demonstrated. The technique is based on the well-known Taylor dispersion experiment for measuring tracer diffusion coefficients. The equipment and working equations are simple, yet the first experimental results show that the method is accurate to 0.2% or better in measuring densities of water and two n-alkanes in the temperature/pressure range 298-440 K and 0.1-3.5 MPa. In this paper the experimental principles are given, along with confirming data and a discussion of possible refinements. The flow tracer method is of particular interest since it can be used to obtain simultaneous measurements of the fluid density and diffusion coefficient of a solute in the fluid.

49980 **Lamella settlers: Material balances and clarification rates.** Maimoni, A. New York, NY; American Institute of Chemical Engineers (1987). 20p. (CONF-870323—). American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017.

From American Institute of Chemical Engineers spring national meeting; Houston, TX, USA (29 Mar 1987).

Technical Paper 3E.

The material balances and clarification rates of a lamella settler can be obtained from the particle size distribution and density of the solid, the liquid density and viscosity, the desired solids concentration in the overhead product, and the feed and underflow solids concentration, using an algorithm based upon a simple geometric model. The method was validated using concentrated suspensions (up to 20 vol% solids) of four different feed particle size distributions of hydrargillite (aluminum hydroxide) in water. Most of the data were obtained in a 60-cm-long settler with 1-cm plate separation inclined at 60° to the horizontal in "open bottom" and "normal" configurations. The hydrodynamics of tube settlers are more complex and the algorithm is not applicable.

49981 **Computer simulation of diffusion-limited chemical reactions in three dimensions.** Torney, D.C.; Warnock, T.T.; Kollman, P. (Los Alamos National Lab., Los Alamos, NM 87545). *International Journal of Supercomputer Application;* **1**: No. 2, 33-43(1987).

Rates of transient diffusion-limited chemical reactions in three dimensions are determined by Monte Carlo computer simulation. Particles are initially placed at random on a cubic periodic Euclidean lattice and perform independent random walks. Pairs of particles arriving at the same site are reacted according to the rules of particular types of chemical reaction; annihilation, bimolecular, and catalytic reactions are simulated. The computational method involves searching partially ordered lists of the particles' coordinates, to find any particles sharing a lattice site. The authors observe the effects of the diffusion coefficients and the stoichiometry of the reactive species on the rate of reaction. The results strongly support the contention that the Smoluchowski-Noyes theory does not give a uniformly accurate prediction of diffusion-limited reaction rates in three dimensions. The only case of substantial disagreement between the simulation results and the theory is found for nearly equimolar bimolecular reaction.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 49252, 50057

49982 Gradient theory of the electric double layer at hydrocarbon—water interfaces. Sweeney, J.B.; Scriven, L.E.; Davis, H.T. (Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, Minnesota, 55455). *Journal of Chemical Physics;* **87**: No. 10, 6120-6127(15 Nov 1987).

Gradient theory of inhomogeneous fluids is used to model the electric double layer at a hydrocarbon—aqueous electrolyte interface. It is applied to a four-component regular solution (two solvent components and two ionic species) in which the dielectric permittivity is also inhomogeneous. The permittivity is determined by a Clausius—Mossotti constitutive equation based on the local densities of the solvent species. The gradient equations are coupled to Poisson's equation and are solved using a Galerkin/finite element scheme. The results indicate that in dilute solution, the dependence of the interfacial tension on bulk electrolyte concentration is linear, and the sign and magnitude of the deviation of the tension from the pure solvent value depends strongly on the degree of ion partitioning between the two phases. In more concentrated solutions, the deviation becomes nonlinear and can change sign as the electrolyte concentration is increased.

4005 Photochemistry

REFER ALSO TO CITATION(S) 50057, 50719

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 49406, 49561

49983 (INIS-BR—745) Study of the stability of benzene phenolic derivative submitted to gamma radiation. Talamoni, J.; Cordeiro, P.J.M.; Talamoni, J.R. (Associacao Brasileira de Quimica, Rio de Janeiro). 1986. 1p. (In Portuguese). (CONF-8603206—6-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703497.

From 1. Latin American meeting on mass spectrometry; Rio de Janeiro, RJ, Brazil (20 Mar 1986).

Published in summary form only.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 49376, 49377, 49419, 49466, 49468, 50282, 50285, 50405, 50406

49984 (CNIC—00018) Synthesis of tritium labelled nucleoside triphosphates by enzymatic phosphorylation. Shen Decun; Ji Linzhen; Liao Sha. (China Nuclear Information Centre, Beijing, BJ). 1986. 6p. (In Chinese). (IAE—0012). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703386.

[5-/sup 3/H]UMP, [5-/sup 3/H]CMP, [8-/sup 3/H]AMP and [8-/sup 3/H]GMP were prepared from 5BrUMP 5BrCMP 8BrAMP and 8BrGMP by catalytic halogentritium replacement at the same time. [5-/sup 3/H]UTP, [5-/sup 3/H]CTP, [8-/sup 3/H]ATP and [8-/sup 3/H]GTP were subsequently synthesized from [5-/sup 3/H]UMP, [5-/sup 3/H]CMP, [8-/sup 3/H]AMP and [8-/sup 3/H]GMP by enzymatic phosphorylation with the crude enzyme prepared from Brewer's yeasts and purified by paper chromatography simultaneously. In addition, four kinds of tritium labelled nucleoside monophosphates and four kinds of tritium labelled nucleoside diphosphates were obtained as the by-products. The specific activity of these products is between 14-19 Ci/mmol and the radiochemical purity is more than 98%.

49985 (IAEA-TECDOC—409, pp 151-152) **Hot atom chemistry at the research reactor WWRS.** Berei, K.; Vasaros, L. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The research reactor WWR-S provides a valuable tool for studying hot atom chemistry. The high energy replacement reactions by recoil halogen atoms (/sup 38/Cl, /sup 82/Br, /sup 125/I, /sup 128/I) produced by (n, γ), IT and EC nuclear processes with substituted aliphatic hydrocarbons and benzene derivatives are investigated.

49986 (INIS-BR—797) Aspects of the radiopharmaceutics production in Brazil. Rodrigues, C. (Academia de Ciencias do Estado de Sao Paulo (Brazil)). 1986. 1p. (CONF-8611184—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703540.

From 11. annual symposium of the ACIESP; Sao Paulo, SP, Brazil (13 Nov 1986).

Published in summary form only.

49987 (INIS-mf—10700) Contributions to thermal and magnetic procedures in pseudo-binary systems of the type alkali chloride-neptunium(IV) chloride. Lehmann, T. (Muenchen Univ. (Germany, F.R.). Fakultaet fuer Chemie und Pharmazie). 24 Jul 1984. 170p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87752885.

The phase diagram RbCl-NpCl/sub 4/ was produced and in this Rb/sub 2/NpCl/sub 6/ was found as a congruent melting compound: Fp=687/sup 0/C. The cesium salt Cs/sub 2/NpCl/sub 6/ was produced to determine the structure of this compound. The lattice parameters for both compounds are: a=8.581 A and c=7.335 A for Rb/sub 2/NpCl/sub 6/ and a=8.657 A and c=7.577 A for Cs/sub 2/NpCl/sub 6/. The phase diagram is supported by measurements by means of differential thermo analysis. A pendulum susceptometer was also produced and tested to determine the magnetic susceptibility of radioactive substances. Cs/sub 2/NpCl/sub 6/, as well as others, was measured and indicated a deviation from the Curie-Weiss Law at temperatures less than 80 K. Because of the extreme moisture sensitivity of Rb/sub 2/NpCl/sub 6/, this compound could not be measured magnetically.

49988 (INIS-mf—10701) Phthalocyaninato complexes of thorium, protactinium and uranium. Beck, O.F. (Technische Univ. Muenchen, Garching (Germany, F.R.). Fakultaet fuer Chemie, Biologie und Geowissenschaften). 1 Mar 1985. 153p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87752886.

For the preparation of Bis(phthalocyaninato)-actinoid(IV) complexes, AnPc/sub 2/, a new optimizing synthesis procedure was developed, with which it was possible to prepare spectrally pure, that is, H/sub 2/Pc-free, ThPc/sub 2/, UPc/sub 2/ and the isostructurally similar /sup 231/PaPc/sub 2/.PaPc/sub 2/. This was verified with the help of electron spectra, which were compared to preparations which were synthesized in another manner. The corresponding perfluorinated compounds were also produced for thorium and uranium by use of tetrafluorophthalic acid nitrile instead of phthalic acid nitrile as initial product. Electron and infrared spectra show the typical bands of the non-substituted complexes. By the at-

tempt to produce a mono(phthalocyaninato)-thorium complex with the use of ThI/sub 4/ as initial material a pyridine-extracted pure ThPcI/sub 2/(py)/sub 2/ was obtained with a typical mono(phthalocyaninato) complex electron spectrum, an extremely moisture sensitive compound which in water or acids decomposes and produces H/sub 2/Pc.

49989 **Evaluation of aromatic iododemetallation reactions as methods for labeling radiopharmaceuticals with iodine-122.** Moerlein, S.M.; Mathis, C.A.; Yano, Y. (Lawrence Berkeley Lab., CA). *Journal of Labelled Compounds and Radiopharmaceuticals;* **23**: No. 10-12, 1237-1238(Oct-Dec 1986). (CONF-8606111—).

From 6. international symposium on radiopharmaceutical chemistry; Boston, MA, USA (29 Jun 1986).

The regiospecificity, high radiochemical yields, and lack of solvent or substituent effects make electrophilic iododestannylation the method of choice for labelling aromatic sites with I-122. However, for compounds where regiospecificity of labelling is not essential, or for cases where stannylation is synthetically difficult, the use of mercurated or germylated arenes may be useful for the production of I-122 labelled radiopharmaceuticals.

49990 **Synthesis and biological evaluation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid, a new dimethyl-branched long-chain fatty acid to evaluate regional myocardial fatty acid uptake.** Goodman, M.M.; Ambrose, K.R.; Neff, K.H.; Knapp, F.F. Jr. (Oak Ridge National Lab., TN). *Journal of Labelled Compounds and Radiopharmaceuticals;* **23**: No. 10-12, 1252-1254(Oct-Dec 1986). (CONF-8606111—).

From 6. international symposium on radiopharmaceutical chemistry; Boston, MA, USA (29 Jun 1986).

Iodine-125-labeled structurally-modified long chain fatty acids that exhibit myocardial extraction and uptake similar to naturally occuring fatty acids, but which show prolonged retention are excellent candidates to evaluate aberrations in fatty acid metabolism that occur when the coronary arteries are normal and perfusion is not impaired. The goal of this study was to develop a dimethyl-branched fatty acid with the radiolabel stabilized as a vinyl iodide with the objective of achieving high myocardial uptake with irreversible retention.

49991 **Chemistry of the actinide elements. Vol. 1, 2nd Ed** . Katz, J.J.; Morss, L.R.; Seaborg, L.R. (eds.). London, England; Chapman and Hall (1986). 886p.

Price Pound 110.00.

The Chemistry of the Actinide Elements is a comprehensive, contemporary and authoritative exposition of the chemistry and related properties of the 5f series of elements: actinium, thorium, protactinium, uranium and the first eleven transuranium elements. This second edition has been completely restructured and rewritten to incorporate current research in all areas of actinide chemistry and chemical physics. The descriptions of each element include accounts of their history, separation, metallurgy, solid-state chemistry, solution chemistry, thermodynamics and kinetics. Additionally, separate chapters on spectroscopy, magnetochemistry, thermodynamics, solids, the metallic state, complex ions and organometallic compounds emphasize the comparative chemistry and unique properties of the actinide series of elements. Comprehensive lists of properties of all actinide compounds and ions in solution are given, and there are special sections on such topics as biochemistry, superconductivity, radioisotope safety, and waste management, as well as discussion of the transactinides and future elements.

49992 **Introduction.** Katz, J.J.; Morss, L.R.; Seaborg, G.T. (Argonne National Lab., IL, USA; Lawrence Berkeley Lab., CA, USA). pp 3-13 of Chemistry of the actinide elements. Vol. 1, 2nd Ed . Katz, J.J.; Morss, L.R.; Seaborg, L.R. (eds.). London, England; Chapman and Hall (1986).

Price Pound 110.00.

The introduction to the 2nd edition of 'The chemistry of the actinide elements' outlines the historical aspects since the discovery of the radioactive decay of uranium, through the production of the first transuranium, transplutonium and transfermium elements to modern attempts to prepare superheavy elements. The advances made in the study of the chemistry of these elements, since the first edition was published in 1957, are outlined.

49993 **Thorium.** Katzin, L.I.; Sonnenberger, D.C. (Argonne National Lab., IL, USA). pp 41-101 of Chemistry of the actinide elements. Vol. 1, 2nd Ed . Katz, J.J.; Morss, L.R.; Seaborg, L.R. (eds.). London, England; Chapman and Hall (1986).

Price Pound 110.00.

The discovery of thorium minerals in 1828, the nuclear properties of thorium 227, 230 and 232, the processing of the thorium ore, monzanite, thorium separation and atomic spectroscopy are discussed. The physical properties of thorium metal and the chemistry of some thorium compounds and organo-thorium compounds and the solution chemistry of Th^{4+} ions are discussed.

49994 **Plutonium.** Weigel, F.; Katz, J.J.; Seaborg, G.T. (Muenchen Univ., Germany, F.R. Inst. fuer Anorganische Chemie; Argonne National Lab., IL, USA; Lawrence Berkeley Lab., CA, USA). pp 499-866 of Chemistry of the actinide elements. Vol. 1, 2nd Ed . Katz, J.J.; Morss, L.R.; Seaborg, L.R. (eds.). London, England; Chapman and Hall (1986).

Price Pound 110.00.

The unique place of plutonium in the history of chemistry is outlined and the nuclear properties of the numerous isotopes tabulated. The synthetic production and purification of Pu 239 and its separation on a large scale are discussed. The chemistry of the metallic and intermetallic compounds and of the organometallic compounds and complexes are discussed. The unique solution chemistry of the five oxidation states of plutonium is also discussed.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 49725, 49726, 49811

49995 **(CONF-8709129—4-Vugraphs) Chemical characterization and toxicological evaluation of airborne mixtures: Smoke generation and characterization: Part 2, Colored smoke grenades.** Buchanan, M.V.; Ma, C.L.; Moneyhun, J.H.; Guerin, M.R. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013875.

From USABRDL contractor's review meeting; Frederick, MD, USA (15 Sep 1987).

The purpose of this project is to chemically characterize the chemical constituents of four colored signal smokes to assess whether chemical constituents of four colored signal smokes to assess whether chemical transformations occur upon combustion of these materials as smoke grenades. These studies center on the characterization of the major components in the four original dye mixes, the generation and collection of both the volatile and particulate components of the combusted dye smokes, and the characterization of the major components of the combusted dyes. The four smoke grenades, red, yellow, violet and green, are composed of organic dyes, and inorganic components. The red dye is a mixture of Solvent Red 1 and Disperse Red 11. The violet dye is Disperse Red 11 and Disperse Blue 3. The yellow dye is Chinoline Yellow (Solvent Yellow 33) and the green dye contains Solvent Green 3 and Chinoline Yellow. Samples of the actual dye mixes used in the manufacture of the grenades were fractionated and the major components identified. Spectroscopic techniques were used to characterize these compounds, including nuclear magnetic resonance (both ^{1}H and ^{13}C), infrared and mass spectrometry. Studies have been initiated on the combustion of the colored smoke grenades, and results on the combusted dyes are presented.

49996 **(SAND—87-1357C) Flammability limits in cocurrent smoldering combustion.** Dosanjh, S.S. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1987. Contract AC04-76DP00789. 9p. (CONF-871118—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014102.

From Combustion Institute fall meeting; Honolulu, HI, USA (22 Nov 1987).

The effect of heat losses on cocurrent (premixed-flame-like) smoldering combustion is investigated using activation energy asymptotics. Expressions for the smolder velocity and the maximum

temperature were derived in the limit of large activation energies. Heat losses were taken to vary with temperature. One result was that solutions ceased to exist when either the oxygen concentration or the inlet oxygen mass flux was lowered below certain critical values. Flammability limits were determined for a polyurethane foam. 6 refs., 2 figs.

49997 **(SAND--87-1443C) Hydrogen-air-diluent detonations: Effect of initial temperature and pressure.** Stamps, D.W.; Tieszen, S.R. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 4p. (CONF-871118—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE87014173.

From Combustion Institute fall meeting; Honolulu, HI, USA (22 Nov 1987).

The effect of initial pressure and initial temperature on the detonation cell width, λ, is addressed theoretically and in part experimentally for hydrogen-air-diluent mixtures. Results show a local minimum in λ as a function of initial pressure and decreasing λ with increasing initial temperature for hydrogen-air mixtures diluted with either steam or carbon dioxide.

49998 **(SAND—87-1444C) Flame acceleration and transition to detonation in channels.** Sherman, M.P.; Tieszen, S.R.; Benedick, W.B. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 4p. (CONF-871118—3). NTIS, PC A02. File Number DE87014193.

From Combustion Institute fall meeting; Honolulu, HI, USA (22 Nov 1987).

Experimental results are reported for combustion of premixed H_2-air mixtures in a 136 m^3 channel and a 1:12.6 linear scale model. Test variables include H_2-air equivalence ratio, obstacles and degree of transverse venting. The results show that flame acceleration is increased by sensitive mixtures, presence of obstacles, large scales, and insufficient venting. The results also support the hypothesis that deflagration to detonation transition (DDT) can occur if the ratio of detonation cell width to channel width is less than a critical value, provided that the flame speed prior to transition has approached the isobaric sound speed.

49999 **(UCRL—96680) Numerical simulation of turbulent premixed combustion and decay of turbulent swirling flow.** Cloutman, L.D. (Lawrence Livermore National Lab., CA (USA)). 1987. Contract W-7405-ENG-48. 7p. (CONF-871118--5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014253.

From Combustion Institute fall meeting; Honolulu, HI, USA (22 Nov 1987).

In recent years multidimensional numerical models have been developed to predict reacting flows in a wide variety of combustion systems. These models must be validated by comparing them to experimental results. This paper presents three numerical simulations using the KIVA and CONCHAS-SPRAY hydrodynamics programs. The KIVA program produces numerical solutions of the full nonlinear, transient, compressible flow, Navier-Stokes equations in two and three dimensions, including moving boundaries, chemical reactions, and turbulence models. The numerical algorithm is based on the arbitrary Lagrangian-Eulerian (ALE) technique. CONCHAS-SPRAY is the two-dimensional ICED-ALE program that was extended to produce KIVA.

50000 **(UCRL—97082) Detailed kinetic modeling of autoignition chemistry.** Westbrook, C.K.; Pitz, W.J. (Lawrence Livermore National Lab., CA (USA)). 22 Jul 1987. Contract W-7405-ENG-48. 55p. (CONF-871142—2). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87013226.

From International fuels and lubricants meeting and exposition; Toronto, Canada (2 Nov 1987).

The development of detailed chemical kinetic reaction mechanisms for analysis of autoignition and knocking of hydrocarbon fuels is described. In particular, kinetic processes of concern for the oxidation of complex hydrocarbon fuel molecules are emphasized. The wide ranges of temperature and pressure which are encountered by end gases in automobile engine combustion chambers result in extreme demands on reaction mechanisms which are intended to describe knocking conditions and predict rates of combustion and ignition. The reactions and chemical species which are most important in each temperature and pressure regime are discussed, and the validation of these reaction mechanisms through comparison with idealized experimental results is described. 53 refs., 8 figs., 5 tabs.

50001 **Homoclinic orbits and mixed-mode oscillations in far-from-equilibrium systems.** Gaspard, P.; Wang, X.h. (Faculte des Sciences, Universite Libre de Bruxelles, B-1050 Brussels, Belgium). *Journal of Statistical Physics;* **48**: No. 1, 151-200(Jul 1987).

Nonlinear autonomous dynamicay systems with a homoclinic tangency to a periodic orbit are investigated. We study the bifurication sequences of the mixed mode oscillations generated by the homoclinicity, which are shown to belong to two different types, depending on the nature of the Liapunov numbers of the basic periodic orbit. A detailed numerical analysis is carried out to show how the existence of a tangent homoclinic orbit allows us to understand in a quantative way a particular and regular sequence of cool flame-ignition oscillations observed in a thermokinetic model of hydrocarbon oxidation. Chaotic cool flame oscillations are also observed in the same model. When the control parameter crosses a critical value, this chaotic set of trajectories becomes globally unstable and forms a Cantor-like hyperbolic repellor, and the ingition mechansim generates a homoclinic tangency to the Cantor set of trajectories.

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REFER ALSO TO CITATION(S) 51046, 51047, 51048, 51049, 51050

50002 **(KURRI-TR—281) Proceedings of the sixth symposium on the development of advanced technology for scientific research.** Shibata, Toshikazu (ed.). (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Aug 1986. vp. (In Japanese). (CONF-8508242—). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780168.

From 6. symposium on the development of advanced technology for scientific research; Osaka, Japan (19 Aug 1985).

Separate abstracts were prepared for the individual papers in this report. (JDB)

50003 **(PB—87-194288/XAB) Study of supercomputers in mechanical-systems research. Final report.** Soni, A.H. (Oklahoma State Univ., Stillwater (USA). School of Mechanical and Aerospace Engineering). Apr 1985. 379p. NTIS, PC A17/MF A01.

The report describes in detail opportunities for the use of Class VI supercomputers in various disciplines of mechanical systems. Participants at this conference/workshop were divided into four groups: (1) Control in Mechanical Systems; (2) Machine Dynamics; (3) Tribology; and (4) Mechanical Systems, Robots and Computer Graphics. Individual reports from these groups are presented, objectives of the research study are summarized, and general and specific recommendations in each of the above four groups are made. Included in the volume are addresses presented at the conference, technical papers by participants of the workshop, and technical papers by the group from the Lawrence Livermore National Laboratory.

50004 **(PNL-SA—14674) The characterization of diagnostic tasks for engineering systems.** Laufmann, S.C.; Whiting, M.A.; Melton, R.B. (Pacific Northwest Lab., Richland, WA (USA)). Feb 1987. Contract AC06-76RL01830. 17p. (CONF-870734—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000093.

From American Association for Artificial Intelligence meeting; Seattle, WA, USA (13 Jul 1987).

Knowledge-based systems (KBS) technology is rapidly gaining acceptance in the engineering community, due largely to the success of systems that are able to accurately diagnose faults in industrial or engineering applications. However, before diagnostic KBS problem-solving technology can become fully functional in the world of software engineering, we must gain a better understanding of the characterization of diagnostic tasks and the means by which such characterizations may be translated into solutions. In

building upon previous task characterization work, we propose a framework for diagnostic task characterization. This framework provides the basis for a new methodology for mapping diagnostic task characterization into solution characteristics.

50005 **(UCRL—96700) Interactions between science and precision engineering.** Atkinson, D.P.; McClure, E.R.; Saito, T.T. (Lawrence Livermore National Lab., CA (USA)). Nov 1987. Contract W-7405-ENG-48. 10p. (CONF-871134—1). NTIS, PC A02. File Number DE87010873.

From International conference on precision engineering; Osaka, Japan (1 Nov 1987).

The history of scientific progress is intertwined intimately with precision engineering. Precision engineering and science have synergistically interacted in stimulating each other to significant advances. Furthermore, tangible benefits to the quality of human life, through often unexpected industrial applications, occur. High energy lasers, astrophysical telescopes, and anamorphic optics, along with developments in ultraprecision machining and measurement, are discussed as examples of evolution in science and precision engineering. Possibilities for ultimate by-products for mankind's welfare are explored.

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REFER ALSO TO CITATION(S) 49278, 49292, 49360, 49361, 49430, 49512, 49670, 49676, 49798, 50041, 50091, 50396, 51007

50006 **(CEA-CONF—8926) From a quantum amplificator: low temperature SQUIDs.** Wellstood, F.; Clarke, J.; Urbina, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique du Solide et de Resonance Magnetique). Dec 1986. 11p. (CEA-DPhG-PSRM—86-087; CONF-861247—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE88750071.

From 5. simposio Chiceno de Fisica; Santiago, Chile (18 Dec 1986).

We report experimental results on the low frequency flux noise of a wide variety of thin-film dc SQUIDs in the temperature range 0.022 to 4.2 K.

50007 **(CONF-870822—7) A prototype expert system for separation science.** Debelak, K.A.; Leuze, M.R.; Bourne, J.R.; Whitlow, J.E.; Antao, B.A.; Patino-Siliceo, O.; Pruett, D.J. (Vanderbilt Univ., Nashville, TN (USA). Center for Intelligent Systems; Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013542.

From American Institute of Chemical Engineers summer national meeting; Minneapolis, MN, USA (16 Aug 1987).

The objective of this work is the creation of an expert system that will aid in solving problems in separation science and technology. Such a system includes a user interface and a core expert system with the ability to access a number of modules designed to retrieve, calculate, and analyze information needed to solve separation problems. These modules include an analytical chemistry data base, existing chemical data bases, regulatory data base, theoretical models, engineering models, and a series of expert systems in each of the important separation technologies.

50008 **(CONF-871163—1) 3-D world modeling for an autonomous robot.** Goldstein, M.; Pin, F.G.; Weisbin, C.R. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 26p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87013878.

From SPIE Cambridge symposium on intelligent robots and computer vision; Cambridge, MA, USA (1 Nov 1987).

This paper presents a methodology for a concise representation of the 3-D world model for a mobile robot, using range data. The process starts with the segmentation of the scene into "objects" that are given a unique label, based on principles of range continuity. Then the external surface of each object is partitioned into homogeneous surface patches. Contours of surface patches in 3-D space are identified by estimating the normal and curvature associated with each pixel. The resulting surface patches are then classified as planar, convex or concave. Since the world model uses a volumetric representation for the 3-D environment, planar surfaces are represented by thin volumetric polyhedra. Spherical and cylindrical surfaces are extracted and represented by appropriate volumetric primitives. All other surfaces are represented using the boolean union of spherical volumes (as described in a separate paper by the same authors). The result is a general, concise representation of the external 3-D world, which allows for efficient and robust 3-D object recognition. 20 refs., 14 figs.

50009 **(CONF-871163—2) Architecture for dynamic task allocation in a man-robot symbiotic system.** Parker, L.E.; Pin, F.G. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 14p. NTIS, PC A02. File Number DE87013872.

From SPIE Cambridge symposium on intelligent robots and computer vision; Cambridge, MA, USA (1 Nov 1987).

This paper presents a methodological approach to the dynamic allocation of tasks in a man-machine symbiotic system in the context of dexterous manipulation and teleoperation. This paper addresses symbiosis containing two partners that work toward controlling a single manipulator arm for the execution of a series of sequential manipulation subtasks. The proposed automated task allocator uses knowledge about the allocation policies of the problem, the available resources, and the tasks to be performed to dynamically allocate tasks to the man and the machine. 6 refs.

50010 (CONF-8511303—, pp 57-72) **Cooling method for forced-cooling superconducting magnets.** Lehmann, W.; Zahn, G. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Technische Physik). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The authors discuss helium forced-cooling of superconducting magnets. They juxtapose the advantages and disadvantages of helium forced-cooling and helium bath cooling, demonstrate the differences between helium single-phase forced cooling and helium two-phase forced cooling, present the process principle and techniques of helium forced cooling, discuss the development of piston-type cryopumps, describe the TOSCA test plant and evaluate the results obtained with tests performed on the LCT-EU coil with helium single-phase forced cooling. (HAG).

50011 (CONF-8511303—, pp 73-87) **Experience gained with HeII cooling of superconducting magnets.** Barth, W.; Lehmann, W.; Turowski, P. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Technische Physik). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The critical data of the superconductor can be enhanced by lowering the cooling temperature below 4 K by means of HeII cooling. The authors present the superfluidic properties of HeII and discuss the HeII cryostat principle. They describe the KfK high-field test stand 'HOMER', its magnet system, cryostat and cooling cycle. In conclusion, they evaluate the operating data and experiences obtained with the high-field test stand by using HeII cooling. (HAG).

50012 (CONF-8511303—, pp 89-104) **Refrigeration supply of a large-scale superconducting particle accelerator system (HERA).** Horlitz, G. (Deutsches Elektronen-Synchrotron, DESY, Hamburg, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The HERA superconducting particle accelerator has a refrigeration system cooling both the magnet ring and the detectors in the test halls. The author describes the total set-up of the cryogenic system, cooling-capacity requirement, the central refrigerator system and its cold boxes, their compressors, gas supply, tunnel transfer lines and control system. In addition, he explains operating processes like the cold and hot processes. (HAG).

50013 (CONF-8511303—, pp 105-117) **Enhancement of the efficiency in large-scale He refrigerating systems.** Egolf, H. (Sulzer Bros. Ltd., Winterthur, Switzerland). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author discusses the exergetic examination of three large-scale refrigerating systems. He presents the three systems SIN 1, ISABELLE and HERA, implements the thermodynamic assessment of the low temperature process by means of the exergetic efficiency and studies the exergy losses of individual system components. The systems are compared qualitatively and their energy balances are established by means of exergy flow diagrams. The exergy required for driving these processes is evaluated. (HAG).

50014 (CONF-8511303—, pp 627-642) **Programmable control systems and process control systems in HVAC technology.** Hadre, E. (Ingenieurbuero Hadre und Partner, Roesrath, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The introduction of microelectronics to the measurement, open-loop and closed-loop control technology in HVAC equipment allows to minimize automatically energy consumptions both on site by improved control qualities and centrally by master programmes. The author focusses on system automation equipment used for establishing an energy management which allows comparisons between actual and planned cost at regular intervals and minimizes application restrictions. The author gives examples of applications for controlling rapid processes like electric maximum load limitation, variable timing programme, disconnection of lighting circuits, shut-off of dual-purpose power plants, and storage loading and unloading programmes. In addition, the author discusses the issue of centralized versus decentralized automation. (HAG).

50015 (DOE/CE/15185—T1) **Construction of an air turbine drilling device and test equipment, and preliminary testing of drilling device: Final technical report, [August 28, 1984 to June 2, 1987].** Flatland, L. (Flatland Dental Products, San Rafael, CA (USA)). Aug 1987. Contract FG01-84CE15185. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000148.

One full-scale drill model and the required test equipment have been built. Several different cutters have been fabricated for testing in various rock types. Tests have been conducted.

50016 (DOE/CE/15268—T2) **Design of a thrust-impact rock splitter: Final technical report.** Lehnhoff, T. (Incubator Technologies, Inc., Rolla, MO (USA)). 15 Sep 1987. Contract FG01-86CE15268. 110p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87014631.

A commercial prototype of a thrust-impact rock splitter has been designed. A complete set of shop drawings are included with this report. In addition there are five photographs of a solid three dimensional computer model of the rock splitting tool. The design is modular such that there is a splitting module, a thrust module and an impact module. Hydraulic power is used for both thrust and impact. This prototype offers the first real opportunity to quantitatively determine the benefits of adding impact to the tool operation. Previous in-situ tests produced highly promising results but these were impossible to state in any quantitative way. A general test program is outlined whereby the potential of the tool can be evaluated in a controlled quantitative manner. 7 refs., 27 figs.

50017 (FRCEA-TH—34) **Study and realization of tunnel niobium-amorphous silicon-niobium junctions.** Khalid, R. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI); Grenoble-1 Univ., 38 (France)). Jul 1985. 182p. (In French). NTIS (US Sales Only), PC A09/MF A01. File Number DE88750072.

This thesis is aimed at contributing to realization and comprehension of tunnel junctions with amorphous semiconductor barrier, leading on stressed characterization of concerned materials. The aim is also to evaluate the integration possibility at a more large scale of junctions Nb-Si-aNb in complex circuits. Josephson tunnel effect with its double theoretical origin, superconductivity and tunnel effects are recalled. The new technological processes of semiconductor barrier junction realization are presented. S.O.P. (selective overlap process) technology is chosen. Niobium and silicon thin films are developed and their electric, optical and physicochemical characterization is presented: conditions of realization, characterization and interpretation of the developed junction behavior.

50018 (FRNC-TH—2495) **Participation to study and realization of phonon microscope (9.4 GHz).** Allibert, J.P. (Institut National Polytechnique, 38 - Grenoble (France)). Jun 1986. 310p. (In French). NTIS (US Sales Only), PC A14/MF A01. File Number DE88750074.

First physics associated to the microscope is theoretically studied: propagation of the hyperfrequency signal, propagation of the acoustic signal and electro-acoustic adaptation, linear and nonlinear acoustics, in helium II at low temperature. The cryogenic amplifier is set in the front of the hyperfrequency reception chain. Experimental results got at temperature upper than 11/sup 0/K are presented. Noise factor (0.7 K) and gain (20 dB) at 20/sup 0/K give a sensitivity around 125 dBm.

50019 (HEDL-SA—3721-FP) **Upgrades of Hanford Engineering Development Laboratory of hot cell facilities.** Daubert, R.L.; DesChane, D.J. (Hanford Engineering Development Lab., Richland, WA (USA)). 1987. Contract AC06-76FF02170. 6p. (CONF-871101—55). NTIS, PC A02/MF A01; GPO Dep. File Number DE87014383.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The Hanford Engineering Development Laboratory operates the 327 Postirradiation Testing Laboratory (PITL) and the 324 Shielded Materials Facility (SMF). These hot cell facilities provide diverse capabilities for the postirradiation examination and testing of irradiated reactor fuels and materials. The primary function of these facilities is to determine failure mechanisms and effects of irradiation on physical and mechanical properties or reactor components. These facilities were described in a previous conference. The purpose of this paper is to review major equipment and facility upgrades that enhance customer satisfaction and broaden the engineering capabilities for more diversified programs.

50020 (INIS-BR—781) **Successful mixed formulation for axisymmetric shell analysis employing discontinuous stress fields of the same order as the displacement field.** Loula, A.F.D.; Miranda, I.; Hughes, T.J.R.; Franca, L.P. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). 1986. 1p. (CONF-8610317—7-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700021.

From 4. Brazilian symposium on piping and pressure vessels; Salvador, BA, Brazil (28 Oct 1986).

Published in summary form only.

50021 (LA—11087-MS) **Thermal analysis of electromagnetic launcher rails.** Schnurr, N.M. (Los Alamos National Lab., NM (USA)). Oct 1987. Contract W-7405-ENG-36. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000166.

A numerical technique has been developed to analyze the combined thermal and electric field diffusion in electromagnetic launcher rails. TOPAZ2D, a two-dimensional finite-element ther-

mal analysis code, has been adapted for this purpose. The resulting code, TOPAZRG, was used to predict the temperature field in the rails of the Lethality Test System being constructed at Los Alamos. Results of those calculations indicate the possibility of localized melting at the rail corners under full-power conditions. A parametric study was made to determine the effect of using tungsten coatings to prevent the melting of rail surfaces. The results of those computations show that the time to melt for a given surface heat flux can be increased by a factor of 2.8. Optimum coating thicknesses were determined for a range of heat fluxes. 11 refs.

50022 **(LA-UR—87-2561) A 1-D model for highly sensitive tubular reactors.** Hagan, P.S.; Herskowitz, M.; Pirkle, J.C. (Los Alamos National Lab., NM (USA); Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Chemical Engineering; Exxon Research and Engineering Co., Annandale, NJ (USA)). 1987. Contract W-7405-ENG-36. 24p. (CONF-871113—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013174.

From American Institute of Chemical Engineers annual meeting; New York, NY, USA (15 Nov 1987).

We consider the steady state operation of wall-cooled, fixed-bed tubular reactors. In these reactors the temperature rise ΔT must normally be limited to small fractions of the adiabatic temperature rise ΔT/sub ad/, both to avoid runaway and maintain product selectivity. Yet ΔT/ΔT/sub ad/ << 1 can only occur if eta = t/sub dif//t/sub reac/ << 1, where t/sub dif/ is the timescale on which heat escapes the reactor by "diffusing" to the cooled walls, and t/sub reac/ is the timescale over which the reaction occurs. So here we use asymptotic methods based on eta << 1 to analyze the 2-d reactor equations, and find the radial concentration and temperature profiles to leading order in eta. We then obtain a 1-d model of the reactor by substituting these asymptotically correct profiles into the reactor equations and averaging over r. This model, the α-model, is identical to the standard (Beek and Singer) 1-d model, except that the reactor's overall heat transfer coefficient U is a decreasing function of the temperature rise ΔT. This occurs because as ΔT increases, the reaction becomes increasingly concentrated near r = 0, causing a decreased heat transfer efficiency through the reactor's walls. By comparing it with numerical solutions of the original 2-d reactor equations, we find that the α-model simulates the 2-d equations very accurately, even for highly sensitive reactors operated near runaway. We also find that a runaway criterion derived from the α-model predicts the runaway transition of the original 2-d equations accurately, especially for highly sensitive reactors. 19 refs.

50023 **(LBL—23822) Design concepts for the ASTROMAG cryogenic system.** Green, M.A.; Castles, S. (Lawrence Berkeley Lab., CA (USA); National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jun 1987. Contract AC03-76SF00098. 9p. (CONF-8706125—13). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014683.

From Conference on advances in cryogenic engineering; St. Charles, IL, USA (14 Jun 1987).

This paper describes the proposed cryogenic system used to cool the superconducting magnet for the Space Station based ASTROMAG Particle Astrophysics Facility. This 2-meter diameter superconducting magnet will be cooled using stored helium II. The paper presents a liquid helium storage concept which would permit cryogenic lifetimes of up to 3 years between refills. It is proposed that the superconducting coil be cooled using superfluid helium pumped by the thermomechanical effect. It is also proposed that the storage tank be resupplied with helium in orbit. A method for charging and discharging the magnet with minimum helium loss using split gas-cooled leads is discussed. A proposal to use a Stirling cycle cryocooler to extend the storage life of the cryostat will also be presented.

50024 **(LBL—23823) Modeling of proximity coupling between superconducting filaments in superconducting dipole magnets.** Green, M.A. (Lawrence Berkeley Lab., CA (USA)). Jun 1987. Contract AC03-76SF00098. 10p. (CONF-8706125—12). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014684.

From Conference on advances in cryogenic engineering; St. Charles, IL, USA (14 Jun 1987).

There is a strong experimental evidence for superconducting current coupling between filaments in fine filament multifilamentary Nb-Ti which has been proposed for the SSC. The coupling between the fine filaments appears to be a Type II superconducting coupling. As a result, ac loss and magnetization can increase as one reduces the filament size in a fine filamentary conductor. This paper presents a computer model which fits experimental data for proximity superconducting coupling between filaments in a superconductor matrix. Using this model, one can predict the effect of proximity coupling on the field uniformity of a dipole magnet for the SSC.

50025 (NP—7770267, pp 27-51) **Time-dependent behaviour of air-cooled heat exchangers.** Kabelac, S.; Kubosch, K. (Hannover Univ., Germany, F.R. Inst. fuer Thermodynamik; Hannover Univ., Germany, F.R. Inst. fuer Kerntechnik). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Air-cooled finned-tube heat exchangers often feature as components in systems for energy production and materials processing. The authors discuss dynamic processes occurring in changes in the inlet state of fluid flows, and use models to describe the time-dependent behaviour of air-cooled heat exchangers. Frequency measurements are performed involving a test stand and a test section, and preparatory activities for measuring the thicknesses of condensate films are described. (HAG).

50026 (NP—7770267, pp 53-72) **Operational strains and stresses on piping systems.** Brumm, J. (Hannover Univ., Germany, F.R. Inst. fuer Mechanik). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

The annual and result report on the subproject A 2 demonstrates the experimental and theoretical models used for investigating into transient processes occurring in piping systems, while focussing on fluid-structure interactions, and describes the experimental set-up complete with its transducers for the detection of the parameters of pressure, stretch, distance and acceleration. The measurement equipment has already been tested in initial steps and the results obtained to-date are being compared with those furnished by literature. The theoretical part of this report is concerned with equations for the theory of bending and for the membrane solution. The outlined solution procedures taken from literature are matched to different requirements made for respective ratios of accuracy of results to degree of complexity. Computer activities involve use of the available software for solving the equations processed for the theory of line.

50027 (NP—7770267, pp 73-111) **Study on time-dependent inducement of vibrations in pipe arrays.** Andjelic, M.; Heyn, A. (Hannover Univ., Germany, F.R. Inst. fuer Mechanik; Hannover Univ., Germany, F.R. Inst. fuer Kerntechnik). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

The paper describes the damage types caused by excessive vibrational movements of the pipes resulting from the interaction of fluidic, elastic and inertial forces. At first, studies are described which are concerned with tube arrays subjected to external and internal fluid excitation, and the results obtained are discussed for their significance. A further chapter demonstrates the methods for measuring pipe vibrations occurring through internal flow of water and through evaporation. (HAG).

50028 (NP—7770267, pp 113-119) **Influence of damping, creep and binding on the vibrational state of pipings.** Niemann, M. (Hannover Univ., Germany, F.R. Inst. fuer Werkstoffkunde). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

The paper provides information on the final stage of activities implemented for the subproject A 4 in the Institute for Materials Research; the results achieved to-date are concerned with experimental activities performed to-date and the elaborate set-up configurations of the different test stands. Tests were aimed at determining the influence of tensile-plus-dynamic stress and of static-plus-dynamic stress on the mechanical behaviour of metals. The project was hampered by insufficient scientific and technical staffing due to non-allocation of required jobs; hence, it was impossible to obtain comprehensive results from tests performed on the chromium-molybdenum steel grades 13 CrMo 4 4, 10 CrMo 4 4, and 15 Mo 3.

50029 (NP—7770267, pp 121-146) **Corrosion behaviour of pipings subjected to dynamic stresses and strains.** Hueper, H. (Hannover Univ., Germany, F.R. Inst. fuer Werkstoffkunde). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Based on studies on the corrosion properties of copper alloys in disturbed flow, the project was aimed at clarifying the influence of dynamic flow states in heat-exchanger tubes on corrosion as well as the influence of sulphidic contaminations. Two flow corrosion circuits were designed and built for these studies, and a control and measuring system was designed for performing measurements on sulphidic contaminations which was suitable for the range of total sulphide concentration between 0.1 and 10 ppm following the evaluation of available results. The tests relevant to the determination of critical flow velocities showed the test materials to exhibit temporal scattering of up to 400% till the onset of passivation. This was attributed to the influence of enrichment of corrosion products in the electrolyte. Concomitant studies allowed to quantify this influence on passivation. Tests performed on tube specimens vibrating at 1.4 m/s showed a change in the corrosion potential from -202 mV (SCE) to -265 mV (SCE) following an exposure period of 500 h. Thus, the potential is of the same order of magnitude as that of freshly pickled specimens. Measurements performed on non-exposed control samples revealed a potential of -120 mV (SCE) after 500 h. Current studies are aimed at determining qualitatively the detected local changes induced by corrosion.

50030 (NP—7770267, pp 147-171) **Flow-induced vibrations in commercial heat-exchangers involving different densities and viscosities of the fluid.** Hesse, F. (Hannover Univ., Germany, F.R. Inst. fuer Verfahrenstechnik). 1986. (In German). NTIS (US Sales Only), PC A17/MF A01. File Number DE87770267.

In Time-dependent processes and damage detection in thermal system components. Progress report: Second half of 1983 to first half of 1986.

Tube-array heat exchangers are known from operating experience to suffer damage due to periodical movements of the tubes. Project A 6 is aimed at studying the fluid-elastic combination of tube vibrations in fluids of different densities and viscosities. The paper reports the state of investigations, the study methods used and the test facility. In addition, it discusses the results achieved with the test facility. (HAG).

50031 **(SAND—87-0160C) Coupling and absorption phenomena in semiconductor-clad dielectric optical waveguides.** Carson, R.F.; Batchman, T.E. (Sandia National Labs., Albuquerque, NM (USA); Virginia Univ., Charlottesville (USA). Dept. of Electrical Engineering). 1987. Contract AC04-76DP00789. 15p. (CONF-8708110—17). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013446.

From 31. SPIE annual international technical symposium on optical and optoelectronic applied science and engineering; San Diego, CA, USA (16 Aug 1987).

Unique propagation characteristics arise from the coupling of light between the lossless modes of a dielectric waveguide and the lossy modes supported by an absorptive cladding layer such as a semiconductor. These effects occur because the propagating lightwave couples into a variety of modes that exist in the semiconductor-clad waveguide. Properties such as cladding thickness, refractive index, and absorption level greatly affect modes of the clad waveguide. Such mode effects are due to periodic coupling between the dielectric layer and the semiconductor cladding. The resulting characteristics suggest use in various device applications. Here, we characterize the periodic coupling effect and how it creates unique modes in the clad waveguide structure. We also describe how the refractive index and absorption of the cladding work together to influence the properties of those modes.

50032 **(SAND—87-0642C) Ultimate velocities for induction launchers.** Cowan, M. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 4p. (CONF-8706155—2). NTIS, PC A02. File Number DE87012360.

From 6. IEEE pulsed power conference; Washington, DC, USA (29 Jun 1987).

The ultimate velocity achievable with railguns will probably be determined by how well one can manage to minimize barrel effects associated with the need for sliding electrical contact between the rails and the armature. However, in principle, electromagnetic launchers can use levitated projectiles which are propelled by induced currents. Then barrel effects can be eliminated altogether, and the ultimate velocity is determined by ohmic heating of the projectile. In this paper, the velocity capabilities for these kinds of launchers - called induction launchers - are discussed. Requirements and pulsed power implications for achieving velocities in the 10 to 100 km/s range are developed.

50033 **(SAND—87-1007C) Evaluation of vision systems for teleoperated land vehicles.** Miller, D.P. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 13p. (CONF-8710124—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013066.

From Conference on systems, man, and cybernetics; Alexandria, VA, USA (20 Oct 1987).

This paper describes an experimental methodology for comparing vision systems that might be used to control a teleoperated, land vehicle. A pilot study compared three forward-looking vision systems in two modes of driver interaction: (1) actual remote driving; and (2) video simulation. Remote driving has the advantage of realism, but is subject to variability in driving strategies and can be hazardous to equipment. Video simulation provides a more controlled environment in which to compare vision-system parameters, but at the expense of some realism. If results demonstrate that relative differences among the visual systems are consistent in the two test modes, then subsequent experimentation, aimed at optimizing vision-system parameters will rely on the more cost-effective, video-simulation approach. The results of the pilot study will be discussed in the conference session.

50034 **(SAND—87-2363C) Ground vehicle convoying.** Gage, D.W.; Pletta, J.B. (Naval Ocean Systems Center, San Diego, CA (USA); Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 17p. (CONF-871163—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000360.

From SPIE Cambridge symposium on intelligent robots and computer vision; Cambridge, MA, USA (1 Nov 1987).

Initial investigations into two different approaches for applying autonomous ground vehicle technology to the ground vehicle convoying application are described. A minimal capability system that would maintain desired speed and vehicle spacing while a human driver provided steering control could improve convoy performance and provide positive control in nighttime and inclement weather, but would not reduce driver manpower requirements. Such a system could be implemented in a modular and relatively low cost manner. A more capable system would eliminate the

human driver in following vehicles and reduce manpower requirements for the transportation of supplies. This technology could also be used to aid in the deployment of teleoperated vehicles in a battlefield environment. The needs, requirements, and several proposed solutions for such an Attachable Robotic Convoy Capability (ARCC) system will be discussed. Included are discussions of sensors, actuators, computers, communications, control systems and safety issues. This advanced robotic convoy system will provide a much greater capability, but will be more difficult and expensive to implement.

50035 **(UCRL—97383) A high-speed, eight-frame image intensified electro-optic camera with 200-800mm zoom objective capability.** Muelder, S.A.; Huen, T.; Firpo, C.S.; Hein, D.F.; Steinmetz, L.L.; Shaw, L.L. (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 7p. (CONF-8708110—16). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000229.

From 31. SPIE annual international technical symposium on optical and optoelectronic applied science and engineering; San Diego, CA, USA (16 Aug 1987).

The versatility of the LLNL developed 75-mm format high-speed electro-optic camera has been improved by the addition of a microchannel plate image intensifier to the electronic image converter, and by the replacement of the discreet objective lens with a commercially available zoom lens. The image intensifier can be operated at a gain of up to 10,000. This allows the use of nanosecond or subnanosecond laser strobe light pulses for object illumination thus improving the time resolution of the camera by at least an order of magnitude. The discreet objective lens of the camera has been replaced with a fast (f/4) 200 to 400 mm zoom lens that when coupled with a quick-connect telephoto adapter (either 1.4x or 2.0x) allows the camera to operate at any focal length from 200 to 800 mm. This permits variable magnification of the object without having to move the camera and without any degradation of dynamic spatial resolution or significant loss of light gathering ability.

50036 **Adapter plate assembly for adjustable mounting of objects.** Blackburn, R.S. (to Dept. of Energy, Washington, DC). US Patent 4,687,165. 18 Aug 1987. Filed date 2 May 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

An object mounting adapted assembly, for securely mounting an object in readily rejustable precise orientation with respect to a mounting surface containing an array of affixation apertures is described comprising: an adapter member, formed to have a base portion having a first surface shaped to contactingly match the mounting surface, the base portion being provided with at least one slot aperture having a length longer than its width, and the adapter member having an object holding portion to securely hold the object mounted thereat; a generally cylindrical locking member, having a first cylindrical portion with a diameter slightly smaller than the width of the slot aperture and a length smaller than the thickness of the base portion around the slot for freely translating along and rotating within the slot aperture during use; the locking member having a second portion having a dimension, normal to the diameter of the axis of the first cylindrical portion, larger than the width of the slot aperture; and the locking member also having a through aperture offset from and parallel to the axis of the first cylindrical portion thereof; and connecting means, passing through the aperture in the locking member and at least one of the affixation apertures of the mounting surface, for connecting the adapter member to the mounting surface with the adapter member clamps between the mounting surface and the second portion of the locking member.

4203 Lasers

REFER ALSO TO CITATION(S) 50983, 50984, 50985, 50986

50037 **(CEA-CONF—8987) Moveable and carriable power lasers.** Merard, R.; Quinque, C.; Contre, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Technologie). Apr 1987. 12p. (In French). (CONF-8703127—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE88750073.

From 4. international technical symposium on optical and electro-optical applied science and engineering; Hague, Netherlands (30 Mar 1987).

Generally the laser beam generator is fixed, and beam is moved thanks to mirrors and wave guides. But beam qualities are lossed in such an operation. So the CEA has studied the mobility of a laser cavity in keeping adjustments and alignments. Two C02 lasers have been developed: the power of the first one is 2KW, the power of the second one is 80W.

50038 **(DOE/DP/40200—29) Laser generated x-ray source for pumping nuclear transitions.** Yaakobi, B.; Letzring, S.; Soures, J.M.; Marshall, F.J.; Richardson, M.C.; Collins, C.B.; Wagal, S.S. (Rochester Univ., NY (USA). Lab. for Laser Energetics). May 1985. Contract FC08-85DP40200. 45p. (CONF-8505370—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014650.

From Gamma ray laser workshop; Washington, DC, USA (1 May 1985).

This collection of vugraphs presents studies of x-ray spectra for resonantly pumping nuclear transitions. The 24 beam OMEGA laser system is being used, generating 0.6 nsec pulses of 2.5 kJ at a wavelength of 351 nm. Total emitted energy approaching 1 J on the 8.4 keV resonance line of Cu^{+27} is measured in a single shot. This energy could be sufficient for resonantly pumping the 8.4099 keV M1 transition in ^{169}Tm from the 1/2+ ground level to the 3/2+ excited level, with a lifetime of 3.9 nsec. Results from a praseodymium target show a spectrally dense x-ray spectrum over an interval of about 1 keV around 8.4 keV, from transitions of n = 2 shell electrons. Spectrally dense bands of successively higher Z targets can be used to maximize the changes of resonant pumping of unknown nuclear levels. The usefulness of a projected high repetition rate laser (>1 Hz) for high data production rate in nuclear excitation experiments is described. We finally show examples of LLE capabilities relevant to gamma-ray laser research in areas such as diffraction in crystals and x-ray studies. 36 figs.

50039 **(LA-UR—87-2961) Spectral evolution equation for the sideband instability in a free-electron laser oscillator.** Channell, P.J. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 17p. (CONF-8709110—7). NTIS, PC A02. File Number DE88000510.

From 9. international free-electron laser conference; Williamsburg, VA, USA (14 Sep 1987).

Assuming that the light remains in the optical system while the electrons pass through and are lost, we have derived the evolution equation for an arbitrary optical spectrum in a free-electron laser oscillator. The resulting integrodifferential equation includes the effects of linear optical system losses (due to either mirror reflectivity or clipping), the usual small signal gain term, and a quadratic nonlinear term that includes the effects of saturation and coupling to sideband modes. The effects of detuning and particle beam current and energy variations can easily be included. Results of numerical solutions of the equations for various conditions will be presented. 3 refs., 4 figs.

50040 **(LA-UR—87-2981) New system for wiggler fabrication and testing.** Warren, R.W.; Elliott, C.J. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 12p. (CONF-8706192—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000505.

From Conference on undulator magnets for synchrotron radiation and free electron lasers; Trieste, Italy (23 Jun 1987).

A system approach is taken for the fabrication and testing of wigglers for free-electron lasers. Emphasis is placed on convenient, practical, assembly procedures that produce wigglers with high fields, two-plane focusing, and facilities for in-place adjustments. Equal emphasis is place on rapid and precise techniques for measuring field errors, both before final assembly and afterward, during wiggler operation. 10 refs., 12 figs.

50041 **(UCRL—95920) Production techniques for the PALADIN free-electron laser wiggler magnets.** Harvey, A.R.; Johnson, R.W.; Morrison, M.E. (Lawrence Livermore National Lab., CA (USA); Lawrence Berkeley Lab., CA (USA)). 1987. Contract AC03-76SF00098;W-7405-ENG-48. 6p. (CONF-870901—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000214.

From 10. international conference on magnet technology (MT-10); Boston, MA, USA (21 Sep 1987).

More than 3000 high-quality, strip-wound, edge-cooled electromagnets for the PALADIN free-electron laser (FEL) experiment at the LLNL Advanced Test Accelerator (ATA) have been fabricated. Close attention to tooling, semiautomated techniques, and selective unit grouping provided the means to manufacture these coils, from prototype to last production unit, within an 18-mo. time frame. In this paper, the evolution and implementation of the manufacturing techniques employed are addressed.

50042 **(UCRL—96859) Laser sources today and tomorrow.** Weber, M.J. (Lawrence Livermore National Lab., CA (USA)). 22 Jul 1987. Contract W-7405-ENG-48. 10p. (CONF-8707107—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014247.

From 1. international conference on laser M 2 P; Lyon, France (7 Jul 1987).

Properties of current gas, liquid and solid-state laser sources are surveyed briefly, including the prospects for their further development. Of particular interest are recent advances in semiconductor diode and tunable solid-state lasers and the expanding experimental activities in x-ray lasers and free electron lasers. Improved electron beams and periodic magnetic structures (wigglers, undulators) are technologies that free electron lasers share with advanced synchrotron radiation sources. The tunable, high brightness, partially coherent radiation from the latter will also be useful for many applications.

50043 **(UCRL—97348) A microwave FEL [free electron laser] code using waveguide modes.** Byers, J.A.; Cohen, R.H. (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 12p. (CONF-8709110—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE88000225.

From 9. international free-electron laser conference; Williamsburg, VA, USA (14 Sep 1987).

A free electron laser code, GFEL, is being developed for application to the LLNL tokamak current drive experiment, MTX. This single frequency code solves for the slowly varying complex field amplitude using the usual wiggler-averaged equations of existing codes, in particular FRED, except that it describes the fields by a 2D expansion in the rectangular waveguide modes, using coupling coefficients similar to those developed by Wurtele, which include effects of spatial variations in the fields seen by the wiggler motion of the particles. Our coefficients differ from those of Wurtele in two respects. First, we have found a missing $\sqrt{2}\gamma/a/$sub w/ factor in his C/sub z/; when corrected this increases the effect of the E/sub z/ field component and this in turn reduces the amplitude of the TM mode. Second, we have consistently retained all terms of second order in the wiggle amplitude. Both corrections are necessary for accurate computation. GFEL has the capability of following the TE/sub 0n/ and TE(M)/sub m1/ modes simultaneously. GFEL produces results nearly identical to those from FRED if the coupling coefficients are adjusted to equal those implied by the algorithm in FRED. Normally, the two codes produce results that are similar but different in detail due to the different treatment of modes higher than TE/sub 01/. 5 refs., 2 figs., 1 tab.

50044 **Scanning picosecond optical parametric source using potassium dihydrogen phosphate in the visible and near infrared.** Anthon, D.W.; Nathel, H.; Guthals, D.M.; Clark, J.H. (Laboratory of Chemical Biodynamics, Lawrence Berkeley Laboratory, and Department of Chemistry, University of California, Berkeley, California 94720). *Review of Scientific Instruments;* **58**: No. 11, 2054-2059(Nov 1987).

An optical parametric source using angle-tuned type II potassium dihydrogen phosphate (KDP) as the nonlinear medium and pumped with 35-ps, 355-nm pulses from an active—passive mode-locked Nd:YAG laser, is described. With a 1.35-mJ pump pulse, conversion efficiencies ranging from 1%—40% in the spectral range 450—650 and 800—1600 nm have been achieved. The $\Delta\nu\Delta t$ products can approach the transform limit, although 15—30 times transform limited is more typical. The merits of the combination of pump wavelength and phase match used here are discussed with respect to the tuning range, spectral width, and ease of operation. Automated scanning was achieved by placing the crystals on stepper-motor controlled rotation stages. A convenient, easily reproducible high peak power source rapidly tunable over much of the visible and near infrared is obtained.

50045 **Noise propagation from pump to secondary lasers.** Yu, A.W.; Agrawal, G.P.; Roy, R. (School of Physics, Georgia Institute of Technology, Atlanta, Georgia 30332). *Optics Letters;* **12**: No. 10, 806-808(Oct 1987).

Experimental measurements of the intensity fluctuations and the associated power spectra for the pump (argon) laser and the secondary (dye) laser show that the secondary laser follows pump fluctuations when operated far above threshold but acts as a low-pass filter when operated close to threshold. The experimental results are well explained by a laser model that accounts for pump fluctuations through a multiplicative colored-noise process. The theory and the experiment are in good quantitative agreement.

50046 **Comparison of Nd 1.06 and 1.33 μm operation in various hosts.** Barnes, N.P.; Gettemy, D.J.; Esterowitz, L.; Allen, R.E. (NASA Langley Research Center, Hampton, VA 23665). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-23**: No. 9, 1434-1451(Sep 1987).

Performances of Nd in various hosts including Nd:YAG, Nd:YLF, Nd:BEL, and Nd:Cr:GSGG were characterized and compared for operation on the nominal 1.06 μm and 1.33 μm transitions. Comparison included continuous mode operation, normal mode operation, Q-switched operation, and gain measurements. Continuous lasing of Nd:Cr:GSGG under lamp pumping is reported for what may be the first time. Characterization included operation with different mirror reflectivities to obtain the internal losses, measurement of the upper laser level lifetime, measurement of the beam quality of the lasers operating under nominally similar circumstances, and measurement of the wavelength. These measurements should provide a comparison of the various Nd hosts under similar circumstances for a wide variety of operational modes and at both wavelengths of interest.

50047 **Recent results from the Los Alamos free-electron laser.** Feldman, D.W.; Warren, R.W.; Carlsten, B.E.; Stein, W.E.; Lumpkin, A.H.; Bender, S.C.; Spalek, G.; Watson, J.M.; Young, L.M.; Fraser, J.S. (Los Alamos National Lab., Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-23**: No. 9, 1476-1488(Sep 1987).

In this paper, the authors review the most recent experimental results of the Los Alamos free-electron laser program. Three major efforts are described: lasing at improved efficiency over that previously attained, electron beam improvement, and energy recovery. An extraction efficiency of 2 percent was achieved with a wiggler having a 12 percent wavelength taper. The beam has been improved so that limits to its quality are now caused, not by injector performance, but by wake fields related to the high peak currents achieved. Limits to optical power set by mirror damage. Experiments are described that demonstrate the successful operation of an energy-recovery system.

50048 **High-brightness injectors for RF-driven free-electron lasers.** Fraser, J.S.; Sheffield, R.L. (Los Alamos National Lab., Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-23**: No. 9, 1489-1496(Sep 1987).

Free-electron laser (FEL) oscillators require pulse trains of high peak brightness and, in some applications, high average power. Recent developments in the technology of photoemissive and thermionic electron sources in RF cavities for electron linac-injector applications offer promising advances over conventional

electron injectors. Reduced emittance growth in high peak current electron injectors may be achieved by using high field strengths and by linearizing the radial component of the cavity electric field at the expense of lower shunt impedance. Harmonically excited cavities have been proposed for enlarging the phase acceptance of linac cavities and thereby reducing the energy spread produced in the acceleration process. Operation of injector linacs at a subharmonic of the main linac frequency is also proposed for enlarging the phase acceptance.

50049 **The effects of harmonic wiggler field components on free-electron laser operation.** Schmitt, M.J.; Elliott, C.J. (Mission Research Corp., Los Alamos, NM 87544). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-23**: No. 9, 1552-1557(Sep 1987).

Harmonics are generated in free-electron lasers as a result of the nonuniform axial motion of the electrons. These motions can be manipulated through the addition of harmonic wiggler fields. A mathematical formalism is developed that described the effects of harmonic wiggler fields on the fundamental and harmonic coupling coefficients. An examination of how these fields can be used to alter the harmonic power output of a free-electron laser is conducted.

50050 **Plasma wave wigglers for free-electron lasers.** Joshi, C.; Katsouleas, T.; Dawson, J.M.; Yan, Y.T.; Slater, J.M. (Dept. of Electrical Engineering, Univ. of California, Los Angeles, CA 90024). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-23**: No. 9, 1571-1577(Sep 1987).

The authors explore the possibility of using a relativistic plasma density wave as a wiggler for producing free-electron laser radiation. Such a wiggler is a purely electric wiggler with frequency ω/sub rho/ (plasma frequency) and wavenumber k/sub rho/. If an electron beam is injected parallel to the plasma wave wavefront, it is wiggled transversely with an apparent wiggler wavelength λ/sub w/ = 2πc/ω/sub rho/. Using plasma densities in the 10/sup 17/ (cm/sup -3/) range, λ/sub w/ of order 100 μm may be obtained, thereby permitting generation of short wavelength radiation with modest energy beams. The effect wiggler strength a/sub w/ = eA/mc/sup 2/ — 0.5 can be extremely large. The authors discuss the excitation methods for such wigglers and examine the constraints imposed by the plasma medium on FEL gain in this scheme.

50051 **Free-electron lasers with electromagnetic standing wave wigglers.** Tran, T.M.; Danly, B.G.; Wurtele, J.S. (CRPP, Association Euratom-Confederation Suisse, EPFL, CH-1007 Lausanne). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-23**: No. 9, 1578-1589(Sep 1987).

A detailed analysis of the electromagnetic standing wave wiggler for free-electron lasers (FEL's) is conducted for both circular and linear wiggler polarizations, following a single-particle approach. After determination of the unperturbed electron orbits in the wiggler field, the single-particle spontaneous emission spectrum and subsequently the gain in the low gain Compton regime (using the Einstein coefficient method) are explicitly calculated. This analysis results in a clear understanding of the resonance conditions and the coupling strength associated with each resonance of this type of FEL. In particular, a striking feature obtained from this investigation is that the electromagnetic standing wave wiggler FEL, under certain circumstances, exhibits a rich harmonic content. This harmonic content is caused by the presence of both the forward and backward wave components of the standing wave wiggler field. In addition, the nonlinear self-consistent equations for this type of FEL are also presented, permitting further investigation of it by the theoretical techniques and numerical codes developed for conventional FEL's.

50052 **Quadrature frequency conversion.** Eimerl, D. (Nonlinear Optical Materials Group, Lawrence Livermore National Lab., Livermore, CA 94550). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-23**: No. 8, 1361-1371(Aug 1987). Contract W-7405-ENG-48.

A technique for frequency conversion of high-power lasers is described which uses two crystals for each conversion step rather than one. The two crystals are oriented so that the waves generated in them are orthogonally polarized. The conversion efficiency of these quadrature arrangements is much less sensitive to laser pulse nonuniformities than that in single-crystal methods. Consequently, very high conversion efficiency is possible for typically nonuniform laser pulses. Realization of the quadrature concept for all types of nonlinear optical processes are described. Data taken on second harmonic generation of Gaussian pulses shows that very high (internal) conversion efficiency is possible (>95 percent) over a substantial range of input energy.

50053 **Chemical kinetics and photon extraction models for KrF.** Hanson, D.E.; Walker, R.B. (Los Alamos National Lab., Theoretical Div., P.O. Box 1663, Los Alamos, NM 87545). pp 110 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Technical Paper TUR3.

In support of the Los Alamos KrF effort, the authors developed an improved comprehensive model of chemical kinetics and photon-pulse propagation for KrF excimer laser systems. The computer code couples a table-driven description of the chemical and photon kinetics with a single-mode single-spatial dimension photon propagator. To solve the 2-D (time and propagation axis) photon transport equation in a self-consistent manner, the kinetics, including photons, are explicitly integrated at multiple axial points (gain sheets), and cavity photon losses, including output coupling, are treated explicitly, resulting in a true 1-D model. Boundary conditions on the solution allow for the treatment of either flat-flat resonator systems or amplifiers. Spatial variation of the chemical rate equations due to nonuniform pumping or extraction is allowed, and the algorithms have been designed to take advantage of the vector capabilities of the CRAY computer series. Laser pulses are generated from spontaneous emission along the propagation axis or from arbitrary input seed pulses. They present results of comparisons of this model to other analytic (e.g., Rigrod) and computer models.

50054 **Short-pulse propagation in KrF multipass amplifier.** Ackerhalt, J.R.; Milonni, P.W. (Los Alamos National Lab., Theoretical Div., P.O. Box 1663, Los Alamos, NM 87545). pp 110 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Technical Paper TUR4.

A computer code has been developed for treating the propagation of optical pulses in a multipass cell in the transient regime, i.e., the medium is time-dependent. In this case the medium is represented by a gas mix appropriate to a KrF laser amplifier consisting of twenty-five kinetics equations and an e-beam pumping source. The computer code treats simultaneous forward and backward propagation of the field along a common axis. Initial input fields can be inserted from either end of the amplifier cell, and mirror reflectivities can be specified. Results of the author's modeling efforts are presented. Amplification of short pulses and the growth of the leading edge of longer pulses are studied. The medium buildup and recovery after the pulse has passed are also shown. Analytic calculations for an asymptotic fluence are compared with numerical calculations. In addition, pulse reshaping effects are discussed.

50055 **High-gain free-electron lasers: Characteristics and applications.** Kim, K.J. (Center for X-ray Optics, Lawrence Berkeley Lab., Berkeley, CA 94720). pp 112 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Technical Paper WAA2.

In simple undulators, electrons, which are initially uncorrelated, remain essentially uncorrelated as the electron bunch moves through the undulator. The radiation emitted in this case, called the

undulator radiation, is analogous to the spontaneous emission in atomic systems. As the number of undulator periods N increases the cumulative effects of the radiation-electron-beam interaction could lead to a density modulation in the electron beam and an exponential amplification of the undulator radiation. Undulators operating in this regime will be called the high gain free-electron lasers (FELs). The radiation emitted in this case is called self-amplified spontaneous emission (SASE) by analogy with laser terminology. The author studied the characteristics of the high-gain FELs starting from the Maxwell-Klimontovich equation. The use of a microscopic description of electrons, the Klimontovich distribution function, is necessary to discuss how SASE emerges in long undulators. Also, his analysis is three-dimensional so that important issues such as guiding and transverse coherence can be clarified. In the exponentially growing regime, he obtained an explicit solution for the radiation amplitude. An important parameter characterizing high-gain FELs is the dimensionless quantity rho, which, for cases considered here, is typically of the order of 10/sup -3/. The paper summarizes the evolution of radiation characteristics from simple undulators to SASE. He considers the performance of high-gain FELs operating in a bypass of low-emittance high-current storage rings.

50056 **Physics issues for high-power free-electron laser amplifiers.** Scharlemann, E.T. (Lawrence Livermore National Lab., P.O. Box 808, Livermore, CA 94550). pp 112 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Technical Paper WAA3.

Light from a high-gain single-pass FEL amplifier is expected, from theoretical and numerical analysis, to be very high optical quality. The light is also anticipated to be guided by the electron beam in the FEL, permitting operation of amplifiers with wigglers that are many Rayleigh ranges long; removal of a restriction to 2 or 3 Rayleigh ranges makes possible much higher extraction efficiencies in the FEL. Neither good optical beam quality nor guiding has been experimentally verified but represents critical uncertainties in the physics of FEL amplifiers. Long wigglers introduce problems associated with transporting the electron beam. Gain in an FEL is produced by coherent synchrotron emission from bunches the size of an optical wavelength in the electron beam. The FEL program at the Lawrence Livermore National Laboratory is examining the physics uncertainties of optical mode quality, optical guiding and wiggler focusing, and the technological problem of wiggler tolerances in the 10.6 μm Paladin experiment. The experiment and its predecessor Elf (at 35 GHz) are reviewed. Efforts to construct a tunable but very accurate electromagnetic wiggler with isochronous focusing are described. Expectations of optical beam quality, optical mode cleanup, and optical guiding are presented.

50057 **Xenon chloride laser kinetics.** Johnson, T.H.; Genoni, T.C.; Cartland, H.E. (U.S. Military Academy, Science Research Lab., West Point, NY 10996). pp 170 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Technical Paper WI55.

The xenon chloride laser has now been operated in a wide variety of conditions of mixture, pulse length, and pump power. Previous attempts to model the operation of the XeCl laser failed to simulate wide ranges of operation, largely because they assume that the energy flows through one or two principal channels. The new kinetic model presented here requires forty-two chemical species and —300 reactions. Pumping the excimer typically proceeds through both ionic and neutral channels with ionic dominating by a factor of —70/30. Keeping with the key experiment of Center et al., the authors assume that no more than —8% of the HCl molecules are in vibrationally excited states at any time; this effectively means lowering the rate of electron the production of Cl/sup -/ and hence of pumping through the ion channel. Other principal features of the new model, which uses either argon or neon buffer gases, include a stimulated emission cross section (4.2 X 10/sup -16/ cm/sup 2/) based on a fit to actual data on XeCl gain profile and a ground-state absorption cross section calculated from a detailed partition function using measured vibrational states and Franck-Condon factors. Reassociation of the ground (X) state from its constituent atoms is also included and proves to be an important factor in limiting extraction efficiency. The model predicts accurately the high-pump-rate experiments conducted at Sandia Laboratories, moderate-pumping experiments at Northrop and Western Research, and low-pumping experiments at Avco. It also successfully predicts sidelight fluorescence from Xe/sub 2/Cl (a major absorber) in experiments at Western Research and electron densities (for attachment-dominated regimes) in experiments at Spectra Technology.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 49270, 49674, 49699, 49759, 49795, 49796, 49797, 49800, 49804, 49810, 49999, 50025, 50026

50058 (CONF-8511303—, pp 155-169) **Influence of the oil content in the refrigerant on the evaporation in tubes.** Zimmermann, F. (Sulzer-Escher Wyss G.m.b.H., Lindau, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author discusses the physical processes occurring in dry evaporators in the presence of oil from the compressor. The author studies the two-phase flow in the evaporator tubes whose fluid consists of a binary refrigerant-oil mixture and whose gas consists of refrigerant vapour, and describes temperature course, pressure drop and heat transfer in the evaporator, and concludes with a discussion of the results obtained by tests performed on an evaporator. (HAG).

50059 **(UCRL—97323) A free-Lagrange method for 2-D compressible flows.** Crowley, W.P. (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 24p. (CONF-8704168—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000216.

From Workshop on particle methods in fluid dynamics and plasma physics; Los Alamos, NM, USA (13 Apr 1987).

Numerical algorithms for solving fluid flow problems are traditionally constructed in either an Eulerian or a Lagrangian reference frame. In the Lagrangian formulation, the mesh follows the fluid motion and this automatically guarantees the accurate treatment of interfaces. However, when large relative motions occur in the flow, the mesh becomes tangled and the problem must be "repaired" before it can continue. The Free-Lagrange method overcomes this difficulty by automatically reconnecting the mesh when necessary during run time. The main advantage of the Free-Lagrange formulation is that problems complete in a minimum amount of calendar time with an accurate solution. Another advantage is that the general mesh structure permits a great deal of flexibility in generating the initial mesh. The disadvantage is that solutions may be more expensive in terms of CPU time because the general structure of the mesh means that gather/scatter parts of the code are not vectorized. Recent hardware developments help ameliorate this consideration.

4205 Materials Testing

REFER ALSO TO CITATION(S) 49521, 49544, 49614, 49817, 49901, 50720, 51004

50060 **(NAGRA-NTB—83-05) Experiments on container materials for Swiss high-level waste disposal projects. Part 1.** Simpson, J.P. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Oct 1983. 66p. Nagra, CH-5401 Baden, Switzerland.

The present concept for final disposal of high level waste in Switzerland consists of a repository at a depth of 1000 to 1500 m in the granitic bedrock of northern Switzerland. The waste will be

placed in a container which is required to function as a high integrity barrier for a number of years following the closure of the repository. The present report is the first of a set of two dealing with the evaluation of potential materials for such containers. The properties which determine the selection of appropriate materials are: the resistance to elevated temperatures and high levels of radiation, mechanical resistance and resistance to corrosion. A review of the available literature leads to the conclusions that polymeric materials are unsuitable primarily because of their inadequate thermal performance and that ceramic materials, in particular alumina, can present problems because of their poor or unproven fracture toughness characteristics. Metals, in view of their mechanical properties and ease of fabrication and use, are considered most likely to provide a satisfactory solution at the present time. The main difficulty lies in proving the integrity of the container for the required life (up to approx. 1000 years) when subjected to corrosion in groundwater under repository conditions. Nodular iron, cast steel, copper, inconel 625 and Ti-Code 12 are judged to be the most promising candidates for further consideration within the Swiss programme. A more detailed appraisal of the materials retained, in particular with respect to corrosion, identifies a number of issues insufficiently covered by the available literature. An experimental programme has been initiated to provide a better data base. In all the experiments the corrosive medium is chosen to represent expected groundwaters at repository depths in Switzerland. An appendix to the present report presents the first experimental results obtained.

50061 **(RISO-M—2395) Application of fluorometallic screens for paper radiography.** Domanus, J.D. (Risoe National Lab., Roskilde (Denmark)). Jul 1983. 23p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752875.

After the description of the fluorometallic screens and their spectral sensitivity their sensitometric properties are reviewed. Characteristic curves and exposure charts were computed for the structurix IC paper, exposed with ordinary fluorescent IC 2 as well as luorometallic RCF screens. From them relative speed, contrast and exposure latitude were computed. Radiographic image quality was investigated using ISO wire IQI's and ASTM penetrometers and the constant exposure methods. The investigation has shown that it is possible and advantageous to use fluorometallic screens for paper radiography, especially above the low kilovoltage range.

50062 **(RISO-M—2396) Special eqipment for etching nitrocellulose film.** Domanus, J.C. (Risoe National Lab., Roskilde (Denmark)). Aug 1983. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87752876.

Nitrocellulose film and converter screens used for neutron radiography are described. Difficulties in visualization of radiographs on those films are mentioned. Because there is no equipment for etching nitrocellulose film available on the market Risoe has designed and produced such equipment at an estimated cost of Dkr. 15,000. Design criteria for this equipment are given and its performance described.

50063 **(SAND—87-0166C) Mechanical shock test specification using nonstationary random excitation models.** Baca, T.J.; Paez, T.L. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 6p. (CONF-8710135—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013650.

From SEM fall meeting; Savannah, GA, USA (25 Oct 1987).

A test specification procedure is described which characterizes an operational mechanical shock environment in terms of the parameters of a nonstationary random process. These parameters define the shock test input which will be applied to a structure in the laboratory using an electro-dynamic shaker. Both the model and the procedure for identifying the model parameters are described. The technique is demonstrated by deriving test specifications from both simulated and actual shock data. The method provides a test specification technique which will allow more realistic simulation of actual mechanical shock environments in the laboratory. 10 refs., 8 figs., 2 tabs.

50064 **(SAND—87-1369C) Structural frequency functions for an impulsive, distributed forcing function.** Bateman, V.I. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 30p. (CONF-8710126—4). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87013811.

From 58. shock and vibration symposium; Huntsville, AL, USA (13 Oct 1987).

The response of a penetrator structure to a spatially distributed mechanical impulse with a magnitude approaching field test force levels (1 to 2 Mlb) was measured. The frequency response function calculated from the response to this unique forcing function is compared to frequency response functions calculated from response to point forces of about two thousand pounds and a hundred thousand pounds. The results show that the strain gages installed on the penetrator case respond similarly to a point, axial force and to a spatially distributed, axial force. This result suggests that the distributed axial force generated in a penetration event may be reconstructed as a point axial force when the penetrator behaves in a linear manner.

50065 **(SAND—87-1441C) Conservatism implications of shock test tailoring for multiple design environments.** Baca, T.J.; Bell, R.G.; Robbins, S.A. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 20p. (CONF-8710126—3). NTIS, PC A02. File Number DE87013927.

From 58. shock and vibration symposium; Huntsville, AL, USA (13 Oct 1987).

Specification of a mechanical shock test requires an engineering decision concerning the relationship between the laboratory and field shock environments. Once a method of shock characterization is selected, test conservatism becomes a measure of the degree to which the laboratory test is more severe than the operational environment of the structure being tested. This paper describes a method for analyzing shock conservation in test specifications which have been tailored to qualify a structure for multiple design environments. Shock test conservatism is quantified for shock response spectra, shock intensity spectra and ranked peak acceleration data in terms of an Index of Conservatism (IOC) and an Overtest Factor (OTF). The multi-environment conservatism analysis addresses the issue of both absolute and average conservatism. The method is demonstrated in a case where four laboratory tests have been specified to qualify a component which must survive seven different field environments. Final judgment of the tailored test specification is shown to require an understanding of the predominant failure modes of the test item.

50066 **(Y—2387) Development of an acoustic emission monitor and monitoring techniques for long-term monitoring of U-0.8Ti electron-beam weldments for postweld cracking.** Whittaker, J.W.; Richey, M.W. (Oak Ridge Y-12 Plant, TN (USA)). Jul 1987. Contract AC05-84OS21400. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000819.

An acoustic emission (AE) monitor and data analysis techniques have been developed for long-term monitoring to detect delayed weldment cracking. The monitor, which comprises multiple identical channels of standard electronic instruments, is capable of measuring the total AE activity in a weldment and the relative energy content of individual AE pulses. The monitor was used to detect the onset of hydrogen-assisted cracking (HAC) in U-0.8Ti electron-beam weldments. Use led to the conclusions that the monitor is adequate to study delayed-cracking phenomena, such as HAC; weldments of the U-0.8Ti alloy do produce AE after welding and intensive AE production coincides with the appearance of macrocracks and their extension; the time-dependency of HAC can be determined from the AE record; and the monitor is a valuable tool for studies of delayed-cracking behavior, such as HAC and stress-corrosion cracking. Recommendations are made to upgrade the monitor to enhance utility and data analysis efficiency and to use the monitor in stress-corrosion cracking studies. The monitor is in regular use on continuing studies of HAC in several alloys. 3 refs., 4 figs.

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 49486, 50179

50067 **(AD-A—182867/2/XAB) Joint Services electronics program. Progress report, 1 April 1986-31 March 1987.** Jenkins, W.K. (Illinois Univ., Urbana (USA). Coordinated Science Lab.). 31 Mar 1987. 83p. NTIS, PC A05/MF A01.

Contents include: crystal growth from the vapor phase and controlled doping of equilibrium and metastable semiconductor alloys: ion/surface interactions; studies of transport phenomena in semiconductors; basic studies of the optical and electronic properties of defects and impurities in compound semiconductor epitaxial layers and related superlattices; heterostructure electronic devices by metallorganic chemical vapor deposition (mocvd); high-speed and other optical properties of MBE-grown structures; computer-aided design of high-performance integrated circuits with ultrasmall features; collective electronic transport in quasi-one-dimensional systems; an investigation of plasma and chemistry processes in cylindrical magnetron plasma discharges; excited-state chemistry in gases; monolithic millimeter-wave integrated circuits with microstrip antennas; investigation of radar-scattering characteristics of controllable surface shapes with application to low observable targets; high-performance testable electronic systems; new directions in fault-tolerant computing; efficient computation techniques; high-resolution sensor-array processing; parallel VLSI structures for sensor-array processing; adaptive algorithms for identification, filtering, control, and signal processing; distributed and decentralized systems; robust feedback control of nonlinear systems; multiple-terminal digital communication systems; statistical signal processing in communication systems; basic research in electronics.

50068 **(SAND—87-1001C) Reevaluating the worst-case radiation response of MOS transistors.** Fleetwood, D.M. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 10p. (CONF-8708137—1-Vugraphs). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014157.

From VHSIC/VLSI qualification reliability and logistics conference; Colorado Springs, CO, USA (25 Aug 1987).

Predicting worst-case response of a semiconductor device to ionizing radiation is a formidable challenge. As processes change and MOS gate insulators become thinner in advanced VLSI and VHSIC technologies, failure mechanisms must be constantly re-examined. This series of Vugraphs presents results of a recent study in which more than 100 MOS transistors were monitored for up to 300 days after Co-60 exposure. Based on these results, a reevaluation of "worst-case" n-channel transistor response (most positive threshold voltage shift) in low-dose-rate and postirradiation environments is required in many cases. In this presentation it is shown for Sandia hardened n-channel transistors with a 32 nm gate oxide, that switching from zero-volt bias, held during the entire radiation period, to positive bias during anneal clearly leads to a more positive threshold voltage shift (and thus the slowest circuit response) after Co-60 exposure than the standard case of maintaining positive bias during irradiation and anneal. We conclude that irradiating these kinds of transistors with zero-volt bias, and annealing with positive bias, leads to worst-case postirradiation response. For commercial devices (with few interface states at doses of interest), on the other hand, device response only improves postirradiation, and worst-case response (in terms of device leakage) is for devices irradiated under positive bias and annealed with zero-volts bias. 2 refs., 9 figs.

50069 **(SAND—87-1602C) Radiation induced latch-up modeling of CMOS IC's.** Hospelhorn, R.L.; Shafer, B.D. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 11p. (CONF-870724—18). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011321.

From 24. annual conference on nuclear and space radiation in electronics; Snowmass, CO, USA (28 Jul 1987).

The basic mechanisms of radiation induced latch-up in bulk CMOS IC's have been relatively well understood for quite a while. There have been a number of attempts to quantitatively model these mechanisms and, to a first order, these have been quite successful. However, the ability to take into account second order effects such as conductivity modulation caused by electron-hole pair generation and two-dimensional effects has been lacking. This paper presents the result of applying a two dimensional, time variant, finite difference code (PISCES) to this class of problem. The results make it possible, for the first time, to quantify the effect of variables such as epi-layer thickness and device layout on the initiation of latch-up. In additions, it has been found that even if latch-up is precluded, the gain of the npn transistor multiplies the effect of the photocurrents such that the onset of rail span collapse induced errors will be accelerated.

50070 **Direct measurement of majority-carrier quasi-Fermi levels in Schottky barrier and metal-insulator-semiconductor diodes.** Seager, C.H.; Schubert, W.K. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **62**: No. 10, 4313-4316(15 Nov 1987). Contract AC04-76DP00789.

A novel point contact technique for directly measuring Fermi-level variations in biased semiconductor diodes is described. This technique is applied to Al/n-Si and Al/SiO_2/p-Si structures, and the results are shown to be in good agreement with the drift/diffusion limit of diode transport theory.

50071 **Brush potential curve tracer.** Finch, H.A. (to Dept. of Energy, Washington, DC). US Patent 4,687,990. 18 Aug 1987. Filed date 21 Jun 1985. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

This patent describes a motor or generator comprising a commutator and a brush, means for determining commutating characteristics comprising: first means for positioning a plurality of probes in juxtaposition with the brush and in contact with the commutator, the first means comprises a holder for the probes, the probeholder is mounted on a support for the brush, the probes are aligned with a direction of rotation of the commutator, and the probes span a distance greater than the dimension of the brush in the direction of rotation of the commutator; and second means associated with the probes for measuring electrical current characteristics of the respective probes; the second means comprises means for measuring electrical current through each of the probes and voltage.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 49259, 49260, 49271, 49272, 49273, 49380, 49381, 50311

50072 **Chelant passivation: New study challenges an old myth.** Tvedt, T.J.; Wallace, S.L. (Dow Chemical Co.). *Power;* **131**: No. 2, 25-28(Feb 1987).

This article points out that the ability of chemical chelants to passivate boiler surfaces against corrosion has been the subject of controversy for many years. Boiler steel is protected from corrosive attack by a thin layer of iron oxide-in most cases magnetite (Fe/sub 3/O/sub 4/). On the one hand, it is commonly believed that high concentrations of "free" chelant will remove the protective magnetite film from the metal surfaces and attack the steel itself. On the other, many hold that proper chelant use in industrial boilers poses no significant risk of corrosion, and in fact enhances corrosion protection. Results of a study reported to the National Assn of Corrosion Engineers supports the latter viewpoint. Records show that chelants were first used as internal water-treatment compounds back in 1961. Their use has grown significantly since then, and today they enjoy extensive application in treatment of boiler water at pressures to about 1300 psig.

50073 **The erosion-corrosion of heat exchanger tubes in fluidized bed combustors.** Levy, A.V.; Yong-Fa, M.; Jee, N. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA). pp 637-655 of Proceedings of the 1987 international conference on fluidized bed combustion: FBC comes of age. Mustonen, J.P. New York, NY; American Society of Mechanical Engineers (1987). (CONF-870540—).

From 9. international conference on fluidized bed combustion; Boston, MA, USA (3 May 1987).

The loss of material from the flame side surfaces of tubes immersed in the beds of fluidized bed combustors (FBC) in many instances has been determined to be due to erosion and erosion-corrosion rather than primarily to high temperature corrosion. Thus, it is necessary to gain an understanding of the mechanisms and rates of surface degradation at elevated temperatures when erosive particles are present in the corrosive gases surrounding the tubes. Work has been carried out to determine how metal loss occurred over service periods up to 10,000 hours in an operating FBC and to relate that behavior to the erosion-corrosion of the same alloys under laboratory conditions. The principal ties between the behavior of the surfaces of the same alloys in the service and laboratory environments were primarily the morphology and, secondarily the composition of the scales which formed on their surfaces.

50074 **Comparison of bubbling and circulating fluidized bed industrial steam generation.** Gaglia, B.N.; Hall, A. (Gilbert/Commonwealth, Inc., Mechanical Engineering Dept., Reading, PA). pp 18-25 of Proceedings of the 1987 international conference on fluidized bed combustion: FBC comes of age. Mustonen, J.P. New York, NY; American Society of Mechanical Engineers (1987). (CONF-870540—).

From 9. international conference on fluidized bed combustion; Boston, MA, USA (3 May 1987).

Atmospheric Fluidized-Bed Combustion (AFBC) for the generation of steam is a viable option for industrial users. This combustion technology has made great advances in general acceptability in recent years. Numerous tests and demonstration projects, including recent commercial units, have proven its technical merits. This paper compares the technical and economic options which face an AFBC project developer. The generally accepted advantages of AFBC for industrial steam generation are: environmental acceptability or greater adaptability to existing and proposed future environmental regulations, and greater fuel flexibility - the ability to burn low grade as well as high grade fuels including waste fuels. Industry has generally accepted the Bubbling Fluidized Bed (BFB) and Circulating Fluidized Bed (CFB) combustors for burning solid fuels to generate steam. This paper considers both dense bed BFB and high velocity lean phase CFB. A technical comparison has been made between the BFB and CFB technologies which evaluates the differences and merits of each.

4250 Power Cycles

50075 (CONF-8511303—, pp 5-15) **Calculation of working fluid parameters in refrigeration engineering. Potentials and methods.** Knapp, H. (Technische Univ. Berlin, Germany, F.R. Inst. fuer Thermodynamik und Anlagentechnik). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author gives a survey on calculation principles for the design of refrigeration technology processes and on available pertinent information. Based on the experimental determination of caloric properties, an enthalpy-temperature or enthalpy-pressure diagram is generated directly. The calculation and correlation of the caloric properties are discussed, the demonstration of thermodynamic information is outlined. In addition, the author demonstrates the structure of a programme package to be used for the thermodynamic, process-technological calculation of a refrigeration circuit and concludes with examples for calculations and further calculation models.

50076 (CONF-8511303—, pp 17-23) **Calculation of working fluid parameters in refrigeration engineering. Practical issues.** Malewski, W. (Borsig G.m.b.H., Berlin, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author deals with the calculation of cryo and heat pump processes which employ multiple fluid mixtures still lacking sufficient clarification of their materials parameters and characteristics. The Rankine Cycle in the overcritical range and a combination process of resorption/compression with a binary mixture are used to exemplify the calculation of missing materials data by means of a mathematical compensation and correlation procedure. Further examples are taken to test the accuracy of these calculations. (HAG).

50077 (CONF-8511303—, pp 25-36) **Refrigeration engineer's approach to obtain working fluid parameters.** Reinhart, A. (Sulzer-Escher Wyss G.m.b.H., Lindau, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A99/MF A01. File Number DE87770270.

From Eurogress Aachen '85: annual meeting of Deutscher Kaelte- und Klimatechnischer Verein e.V.; Aachen, F.R. Germany (20 Nov 1985).

DKV-Tagungsbericht.; Vol. 12.

The author describes major sources and pathways for obtaining refrigeration working fluid parameters while studying the need and acquisition of these parameters in general and of the parameters for conventional refrigerants. The working fluid data for oil-refrigerant mixtures are discussed and various sources for working fluid material for refrigeration systems are presented. (HAG).

50078 (PNL-SA—14920) **Fundamental flow and heat transfer results relevant to oscillating flow regenerators.** Hutchinson, R.A.; Ross, B.A. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1987. Contract AC06-76RL01830. 8p. (CONF-870804—41). NTIS, PC A02. File Number DE88000096.

From 22. intersociety energy conversion engineering conference; Philadelphia, PA, USA (10 Aug 1987).

Complete understanding of the operation of Stirling and other heat engine regenerators has evaded engineers working on engine development because making measurements in or near such a regenerator is so difficult. Some illumination of the physics that may be involved, however, can be found by studying fundamental experimental results in the literature, results that were examined for other applications in addition to Stirling. Preliminary reviews of literature on the subjects of oscillating flows, periodic flows and porous media have brought to light interesting papers presenting a number of phenomena that may be of importance in heat engine regenerators. Some are also relevant to flows in other Stirling heat exchangers. These topics include heat transfer during compression and expansion, enhanced conduction in oscillating laminar flows, approaches to analysis of nonuniform porous media, and heat transfer enhancement mechanisms in porous media. Each topic is briefly described and discussed in this paper, and a summary of physical phenomena that may affect regenerator performance is presented. 27 refs., 3 figs., 1 tab.

43 PARTICLE ACCELERATORS

REFER ALSO TO CITATION(S) 50504

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 49469, 50012, 50111, 50119, 50428, 50921

50079 (FNAL-TM—1467) **Upgrading the Tevatron to a 1 TeV on 1 TeV pp collider.** Teng, L.C. (Fermi National Accelerator Lab., Batavia, IL (USA)). 12 Aug 1987. Contract AC02-76CH03000. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000697.

This report describes the tasks necessary to change the Tevatron into a proton-proton collider. Also included in the discussion is an estimate of the cost to carry out the modification. 4 figs., 3 tabs. (JDH)

50080 (IAEA-TECDOC—410, pp 29-35) **Multi-particle accelerator for neutron and high-let radiation research.** Johnson, R.G. (National Bureau of Standards, Gaithersburg, MD, USA). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The staff of the Center for Radiation Research of the National Bureau of Standards (NBS) has recently analyzed the neutron and high-LET radiation research program at NBS. From this study it was recommended that a full design study of a linear induction accelerator as a possible replacement for the present electron linac be performed. This paper is an updated report on the preliminary study on which that recommendation was based. Recent technological advances have significantly improved the practicality of induction linacs for moderate-energy high-current accelerator applications. Of primary significance is the development of magnetic pulse compression techniques and the related development of iron-based metallic glasses. The target parameters of the preliminary design were chosen with many considerations in mind and represent in most cases only modest requests of the technology. The accelerator was designed to accelerate up to 250 A of electrons to 100 MeV with a pulse structure of 100-ns maximum length at repetition rates up to 1000 Hz. Because of the versatility of induction linacs, protons and other light ions can also be accelerated with currents limited only by space charge effects. The design includes provision for accelerating protons and deuterons at maximum currents of 2.5 A and 1.2 A, respectively. This accelerator would be a powerful and versatile tool for neutron and high-LET radiation research. Both continuous and quasi-monochromatic beams of neutrons would be available and the light ions could be used directly. 15 refs, 4 figs, 3 tabs.

50081 (IAEA-TECDOC—410, pp 35-56) **Electron linac based pulsed white neutron sources for high resolution neutron time of flight spectroscopy - status and perspectives.** Boeckhoff, K.H. (Commission of the European Communities, Geel, Belgium. Central Bureau for Nuclear Measurements). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

With RF linacs nowadays intense, subnanosecond bursts of neutrons can be produced which allow neutron time of flight measurements in a range covering in favourable cases 11 decades of neutron energy (1 meV-100 MeV). The number of neutrons contained in such short bursts is larger that the corresponding numbers generated with the short burst spallation source at LAMPF and with the Karlsruhe cyclotron. The considerably larger average neutron intensities at the latter two accelerators are due to the much higher pulse repetition frequencies. This advantage is cancelled if pulse overlap conditions require a reduction of the PRF down to the level at which electron linacs operate. Taking this into account the contemporary linac equipped with a subnanosecond pulsing facility like GELINA continues to offer the best intensity/resolution performance for neutron time of flight spectroscopy between 10 keV and a few MeV. At very low (meV range) and at high (> some ten MeV) neutron energies the LAMPF neutron sources occupy with distinction the first rank while in the low MeV range the KFK cyclotron is clearly superior to electron linacs and competitive with the LAMPF short burst satellite source. Plans or thoughts to replace some electron linacs by more powerful accelerators have existed for several years. So far none of them has had the chance of realization. Instead of going the way of completely new and very expensive concepts which carry a non-negligible technological risk, for the field of applied neutron nuclear data the following two approaches are suggested: a) Case of dominant interest in neutron data for fission reactors: Exploitation of the L-band linac to the same level as it is done for S-band linacs, including post acceleration pulse compression. b) Case of dominant interest in neutron data for fusion reactors: Use of KFK cyclotron type source. 29 refs, 12 figs, 2 tabs.

50082 (IAEA-TECDOC—410, pp 76-79) **Efficiency of pulsed sources of neutrons from the point of view of spectrometric studies.** Muradyan, G.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Efficiency of studies performed by using the time-of-flight method is considered. A high rate of recording neutron-matter interaction is important for and characteristic of these studies. Some criteria for selection and optimization of pulsed sources and neutron spectrometers for the studies of this type have been deduced. Concrete sources are considered as well as possibilities of raising their efficiency. 3 refs, 1 fig, 1 tab.

50083 (IAEA-TECDOC—410, pp 99-107) **Intense neutron fields for radiation damage studies.** Dierckx, R. (Commission of the European Communities, Ispra, Italy. Joint Research Centre). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Damage, due to radiation by neutrons or charged particles, has to be taken into consideration whenever a material is used as part of a radioactive plant (fission or fusion reactor, accelerator and so on). It is necessary to be able to estimate this damage, especially for future fusion reactors, due to the high investment costs. Therefore, knowledge has to be gained about the damage-producing mechanisms and the correlations between damage and radiation source parameters (energy spectrum, flux and fluence). Up to now damage studies for fusion applications have been done with fission neutrons, medium-intensity high-energy neutron sources and charged particles. To validate these radiation damage results and make them useful for fusion application, correlations have to be established in radiation environments similar to those of the first wall of a fusion reactor. This can only be done in a fusion reactor itself, or in specially built neutron sources producing or simulating a first wall radiation environment. The types of possible sources are: 1) 14 MeV sources based on the d-t reaction; 2) d-Li sources which have a broad spectrum, peaking at 14 MeV but with a tail up to 40 MeV; 3) spallation neutron sources which have an evaporation spectrum and a high-energy tail up to 200 - 300 MeV. Except for the 14 MeV sources, the others are simulations; and the damage results have to be correlated with real fusion spectra. The characteristics of the neutron sources are discussed and compared, especially in relation to their use for fusion applications. 49 refs, 4 figs, 1 tab.

50084 (IAEA-TECDOC—410, pp 230-238) **Possibilities of experimental determination and theoretical prediction of different properties of accelerator based neutron sources.** Kornilov, N.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The paper considers the possibilities of theoretical description of various neutron source characteristics on the example of a gas deuterium target. It has been shown, that with proper models adopted not only the first moments but the function of neutron flux energy distribution can be calculated with good accuracy. There is a review of experimental measurement methods for incident particle energies, mean neutrons energies and distribution functions. Attention is paid to the systematic disagreement between the experimental and theoretical neutron fluxes from the gas target. A monoenergetic neutron source is totally determined by a distribution function of the neutrons by the energy and the angle of escape PHI(E, θ). In many cases, when the value σ(E) investigated is independent on an angle and can be described by a linear function in the range of averaging it is enough just to take into account the first moment of distribution. For this purpose the following factors should be taken into account: 1. Space distribution of incident particles; 2. Energy losses in target materials, energy and angle straggling, surface inhomogenety. 3. Energy and reaction cross-section variation with on the angle of neutron escape. Some of the above factors are often ignored at neutron source calculation, which may result in systematic energy shifting, may alter the neutron flux dependence on a distance, etc. At the same time all the factors affecting PHI(E) are calculated with the sufficient accuracy. That is the consideration of theoretical models of calculation and experimental methods of neu-

tron source characteristics measurement the present work is devoted to. 28 refs, 5 figs, 2 tabs.

50085 (IAEA-TECDOC—410, pp 239-250) **Production of fast neutrons with targets of the hydrogen isotopes - source properties and evaluation status of the cross-sections.** Drosg, M. (Vienna Univ., Austria. Inst. fuer Experimentalphysik). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

An updating survey of the three basic monoenergetic neutron sources /sup 3/H(p,n)/sup 3/He, /sup 2/H(d,n)/sup 3/He and /sup 3/H(d,n)/sup 4/He is given including the inverse reactions / sup 1/H(t,n)/sup 3/He and /sup 2/H(t,n)/sup 4/He. Source properties and the accuracy of the differential cross sections are discussed. In addition fast neutron production by t-T and by inverse (p,n) reactions (e.g. /sup 1/H(/sup 7/Li,n)/sup 7/Be) and inverse (d,n) reactions is considered. 41 refs, 7 figs, 8 tabs.

50086 (IAEA-TECDOC—410, pp 251-256) **Neutron sources with lithium target.** Yamanouti, Y. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The /sup 7/Li(p,n)/sup 7/Be reaction is widely used as a source of monoenergetic neutrons. Usefulness of the /sup 7/ Li(p,n)/sup 7/Be reaction as a monoenergetic neutron source can be evaluated from the characteristics on zero-degree energy spectra, zero-degree cross sections, angular distributions, and total reaction cross sections of the reaction. The /sup 7/Li(p,n)/sup 7/Be reaction on a thin lithium target is the most practical source of monoenergetic neutrons with neutron energy spread of about 400 KeV at proton energies above 30 MeV. It is also to be noticed that the / sup 7/Li+p and /sup 7/Li+d reactions on thick lithium targets are useful sources of intense neutron beams for applications where the monoenergetic characteristics are not required. In these reactions the /sup 7/Li+d reaction produces the zero-degree neutron yield higher than the /sup 7/Li+p reaction at the same projectile energy. In this paper characteristics of the /sup 7/Li(p,n)/sup 7/Be reaction as a monoenergetic neutron source and production of intense neutron beams from the /sup 7/Li+p and /sup 7/Li+d reactions are presented. 31 refs, 3 figs, 5 tabs.

50087 (IAEA-TECDOC—410, pp 303-312) **RTNS-II: Experience at 14 MeV source strengths between 1 x 10/sup 13/ and 4 x 10/sup 13/ n/s.** Davis, J.C. (Lawrence Livermore National Lab., CA, USA). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The RTNS-II Facility was built at LLNL from 1976 to 1978 to provide two 14-MeV sources dedicated to irradiation of materials and components for the Magnetic Fusion Program of the United States Department of Energy. Initial experiments began in early 1979 with a single source operating at a strength of 1x10/sup 13/ n/s. In 1982, a five-year agreement was signed between the US DOE and the Ministry of Science, Education and Culture of the government of Japan to operate the facility jointly for fusion irradiation experiments. Under this agreement, both neutron sources became operational with source strengths rising to near the original design goal of 4x10/sup 13/ n/s. Nominal source design parameters are 150 mA of D/sup +/ focused to a 1-cm diameter spot on a 5000 rpm titanium tritide target, producing a maximum useful flux of 1.3x10/sup 13/ n/cm/sup 2/s. In the past eight years, approximately one hundred 23-cm targets and seventy-five 50-cm targets have been produced and used. Target output decays with a half-life varying from 75 to 200 hours at currents near 125 mA. Average initial yield on a new target is 2.1x10/sup 11/ n/s-mA; average total yield of a target before replacement is 1.1x10/sup 19/ neutrons. Lifetimes of ion source components range from 200 hours for cathode assemblies to as much as 1200 hours for extraction electrodes. Power supplies, acceleration columns, most beam transport components and radiological systems have imposed no significant operational limitations. Maximum fluence delivered in irradiations to date has been 1x10/sup 19/ n/cm/sup 2/. Operation of the facility is currently scheduled to cease at the expiration of the joint agreement in February of 1987. The operational experience gained with accelerator, target and radiological systems will be reviewed, as well as design options and changes appropriate for inclusion in solid target 14-MeV generators designed to operate at higher source strengths. 7 refs, 5 figs, 1 tab.

50088 (INIS-BR—688, pp 86) **Status and experimental projects of TANDAR.** Otero, D. (Comision Nacional de Energia Atomica, Buenos Aires, Argentina). 1984. (In Spanish). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

The stage of development of the TANDAR project in Argentine is presented. The project consists on installing a 20 MV Van de Graaff Tandem accelerator in Buenos Aires. The vacuum system, the mass spectrometer, the control systems of instruments and the data acquisition system are described. (M.C.K.).

50089 (LBL—22750, pp 1-13) **1-2 GeV synchrotron radiation source.** 15 Apr 1987. NTIS, PC A05/MF A01. File Number DE87013955.

In Accelerator and Fusion Research Division: Summary of activities, 1986.

Activity within AFRD has been shaped, to a large extent, by the increasing likelihood that construction will begin soon on a major new research facility - an electron storage ring optimized to produce synchrotron radiation in the ultraviolet and soft x-ray regions of the spectrum. In November 1985, a group of 200 potential users of this facility affirmed the basic parameters of a machine first proposed for construction in 1982 (the Advanced Light Source, or ALS), thus establishing the basis for a six-month period of intensive design effort. This effort culminated in June 1986 with a conceptual design report (CDR) for a 1-2 GeV Synchrotron Radiation Source, colloquially the Light Source. As a source of radiation with extremely high spectral brightness and considerable coherent power, the Light Source is of great interest to a diverse community of scientists. The ultraviolet region is particularly interesting to such groups as chemists and surface scientists, and the soft x-ray region, containing the primary (K-shell) resonances of the lower-Z elements and the L-shell resonances of intermediate-Z elements, is of special interest for industrial lithography, interface studies, atomic physics studies, and studies of living biological systems within the so-called "water window" between 24 and 44 angstroms. Design and details of this light source are considered in this report.

50090 (LBL—22750, pp 33-48) **Accelerator operations.** 15 Apr 1987. NTIS, PC A05/MF A01. File Number DE87013955.

In Accelerator and Fusion Research Division: Summary of activities, 1986.

The Bevalac continues to play a unique role, both in the national nuclear science program and as a research facility for biological and medical research. Owing largely to the Bevalac's pioneering successes, especially in the field of relativistic heavy-ion physics, other heavy-ion synchrotrons and storage rings will soon be operational, including some whose aim is to push to much higher energies. Until at least the early 1990's, however, the Bevalac will remain a one-of-a-kind source of the heaviest ions at energies up to nearly 1 GeV/amu. Included in this report are summaries of past operations and users research highlights and plans of upgrading the Bevalac to handle medium-energy heavy ions. (LSP)

50091 (LBL—22750, pp 49-62) **High-energy physics technology.** 15 Apr 1987. NTIS, PC A05/MF A01. File Number DE87013955.

In Accelerator and Fusion Research Division: Summary of activities, 1986.

Between the present and the 21st century, lies the Superconducting Super Collider (SSC), currently the top priority of the nation's high-energy physicists and the focus of most efforts in this field. In particular, this continues to play leading roles in the development of high-field superconducting magnets and in accelerator

physics studies at the SSC Central Design Group. The superconducting-magnet program has a quarter-century-long history of magnet development, the broad aim being to develop practical accelerator-type magnets with the highest possible fields. Activities over the past years have encompassed studies of several superconducting materials and a variety of magnet designs, and achievements have included record magnetic fields. During 1986, however, all of our work in this area - even that with further-reaching implications - was dominated by the imminence of the SSC. Such activities included continued design and testing of 1-meter-long model dipoles, the design of SSC quadrupole magnets, and the development of much-improved superconducting cable. Even more tightly tied to the SSC effort was the work of AFRD accelerator physicists assigned to the SSC Central Design Group, where their most visible achievement was their significant contribution to the SSC conceptual design report, published in March 1986.

50092 **(LBL—23206) A scientific workstation operator-interface for accelerator control.** Paxson, V.; Jacobson, V.; Theil, E.; Lee, M.; Clearwater, S. (Lawrence Berkeley Lab., CA (USA)). 23 Apr 1987. Contract AC03-76SF00098. 14p. (CONF-870302—249). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014689.

From Particle accelerator conference; Washington, DC, USA (16 Mar 1987).

Research in human factors has demonstrated that people use computers more efficiently and effectively if they have a highly visual interface to the machine. Today's scientific workstations provide sufficient power to implement such interfaces. By using these workstations, an operator interface for an accelerator control system can be built which is powerful, flexible, and easy to learn. We discuss such a system currently being developed on a Sun-3 workstation. The system is designed as a set of building blocks (e.g., "Working Diagram," "Twiss Plot," "Beamline", "Orbit Correction") which can be run independently or linked together. This toolbox approach gives the operator the ability to execute precisely those programs needed for the task at hand. Each program runs in a separate window and communicates with other running programs via a common data base. When the operator makes a change in one window, the effects are then shown in the other windows. For example, to change the tune of the machine while monitoring beam scraping, the operator activates the "Working Diagram" and "Beam Position" tools. The operator points to the new tune on the working diagram window and sees the effects it would have on the beam profile in the other window.

50093 **(NIIEFA-P-V—0709) Nonstationary processes in a multiresonator accelerating system under beam loading.** Vorogushin, M.F.; Malyshev, V.N. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703635.

Problems, related to steady and transient process analysis appear to be quite important in the course of development of standing wave linear accelerators. Solution of a self-consistent problem, concerning nonstationary processes in RF-generator-matching channel - multiresonator structure - accelerated beam system is presented. The problem solution is performed by complex envelope method. Relations, making up the basis for multiresonator accelerating structure (AS) mathematical model are derived. They describe transient and steady processes in AS under the optional action, given by the envelope. AS current load within the framework of the constructed model is accounted by the introduction of the wave, emitted by the beam in a semi-infinite waveguide. Calculation of the envelope, induced by a wave beam is presented. Wave envelope algorithm in the accelerating structure and at the matching device inlet is given. 13 refs.; 7 figs.

50094 **Superconducting linear accelerators for heavy ions.** Bollinger, L.M. (Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Annual Review of Nuclear Science;* **36**: No. 1, 475-503(1986). Contract W-31-109-ENG-38.

The use of superconducting resonator cavities in heavy ion linear accelerators is reviewed. The Argonne tandem-linac accelerator system is discussed in detail. (AIP)

50095 **Review of proposed kaon factory facilities.** Macek, R.J. (Los Alamos National Laboratory, Los Alamos, NM 87545). *AIP (American Institute of Physics) Conference Proceedings;* **133**: No. 1, 346-376(15 Sep 1985). (CONF-8503120—).

From Hadronic probes and nuclear interactions conference; Tempe, AZ, USA (11 Mar 1985).

A number of proton accelerator facilities, popularly called "Kaon Factories," have been proposed to extend the intensity frontier from about 1 GeV to higher energies in the range of 15—45 GeV. Seven proposed facilities: LAMPF II, TRIUMF II, SIN II, AGS II, KEK, MUNICH, and KYOTO: are reviewed with emphasis on capabilities of the experimental facilities. Costs and the choice of energy and current are also discussed.

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 50084, 50978

50096 **(CERN—87-03-Vol.1) CAS CERN Accelerator School: Advanced accelerator physics. Proceedings. Vol. 1.** Turner, S. (ed.). (European Organization for Nuclear Research, Geneva (Switzerland)). 21 Apr 1987. 426p. (CONF-8509330—Vol.1). NTIS (US Sales Only), PC A19/MF A01. File Number DE88700001.

From CERN accelerator school; Oxford, UK (16 Sep 1985).

This advanced course on general accelerator physics is the second of the biennial series given by the CERN Accelerator School and follows on from the first basic course given at Gif-sur-Yvette, Paris, in 1984. Stress is placed on the mathematical tools of Hamiltonian mechanics and the Vlasov and Fokker-Planck equations, which are widely used in accelerator theory. The main topics treated in this present work include: nonlinear resonances, chromaticity, motion in longitudinal phase space, growth and control of longitudinal and transverse beam emittance, space-charge effects and polarization. The seminar programme treats some specific accelerator techniques, devices, projects and future possibilities.

50097 **(CERN—87-03-Vol.2) CAS CERN Accelerator School: Advanced accelerator physics. Proceedings. Vol. 2.** Turner, S. (ed.). (European Organization for Nuclear Research, Geneva (Switzerland)). 21 Apr 1987. 430p. (CONF-8509330—Vol.2). NTIS (US Sales Only), PC A19/MF A01. File Number DE88700002.

From CERN accelerator school; Oxford, UK (16 Sep 1985).

This advanced course on general accelerator physics is the second of the biennial series given by the CERN Accelerator School and follows on from the first basic course given at Gif-sur-Yvette, Paris, in 1984. Stress is placed on the mathematical tools of Hamiltonian mechanics and the Vlasov and Fokker-Planck equations, which are widely used in accelerator theory. The main topics treated in this present work include: nonlinear resonances, chromaticity, motion in longitudinal phase space, growth and control of longitudinal and transverse beam emittance, space-charge effects and polarization. The seminar programme treats some specific accelerator techniques, devices, projects and future possibilities.

50098 **(CNIC—00019) Numerical computation methods for magnet design of spectrometer, accelerator and beam transport systems.** Fan Mingwu; Maio Yixin. (China Nuclear Information Centre, Beijing, BJ). 1986. 7p. (In Chinese). (IAE—0013). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703387.

High calculation accuracy is expected in the design of spectrometer, accelerator or beam transport systems. Three dimensional electromagnetic field computation is needed in some cases. In solving these problems, numerical computation methods have been dominating in the area. Advantages and disadvantages among the methods are discussed and errors between computed and measured values are analysised. The application of making full use of these methods is discussed based on some practical models.

50099 **(LBL—22985) Incorporation of toroidal boundary conditions into program POISSON.** Laslett, L.J.; Caspi, S.; Helm, M. (Lawrence Berkeley Lab., CA (USA)). 17 Jul 1987. Contract AC03-76SF00098. 42p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000477.

A technique is developed for introduction of a boundary condition applicable to relaxation computations for magnetic problems with axial symmetry and with no sources (currents, or magnetized material) external to the boundary. The procedure as described in this note is restricted to cases in which the (toroidal) boundary will surround completely the region of physical interest but will not encompass the axis of rotational symmetry. The technique accordingly provides the opportunity of economically excluding from the relaxation process regions of no direct concern in the immediate neighborhood of the symmetry axis and hence can have useful application to annular magnetic devices with axial symmetry. The procedure adopted makes use internally of the characteristic form of the vector-potential function, in a source-free region, when expressed in toroidal coordinates. The relevant properties of associated Legendre functions of half-integral degree are summarized in this connection and their introduction into the program POISSON is outlined. Results of some test cases are included, to illustrate the application of this technique for configurations with median-plane symmetry. 8 refs., 9 figs.

50100 **Particle spin tune in a partially excited snake.** Lee, S.Y.; Tepikian, S.; Courant, E.D. (Brookhaven National Laboratory, Upton, NY 11973). *AIP (American Institute of Physics) Conference Proceedings;* **145**: No. 1, 185-188(20 Jul 1986). (CONF-8504161—).

From Workshop on polarized antiproton sources; Bodega Bay, CA, USA (18 Apr 1985).

The special method of Siberian Snakes which correct for the depolarization effects of cyclotron resonances at high energies need not be used during beam production at low energies when low energy conventional methods apply. An adiabatic method (dependent upon particle spin precession frequency) of switching the snakes off or on during beam production is discussed.

50101 **Simple analytic formula for the strength of spin depolarizing resonances.** Lee, S.Y. (Brookhaven National Laboratory, Upton, NY 11973). *AIP (American Institute of Physics) Conference Proceedings;* **145**: No. 1, 189-198(20 Jul 1986). (CONF-8504161—).

From Workshop on polarized antiproton sources; Bodega Bay, CA, USA (18 Apr 1985).

A simple analytic formula is derived to explain the periodicity of spin depolarizing resonance. The spin depolarizing resonance strengths of CPS and SPS at CERN and the lattices of meson factory at TRIUMF are used to compare with the analytic formula.

50102 **Analytic method for spin transfer matrix in presence of snakes.** Tepikian, S. (Brookhaven National Laboratory, Upton, New York 11973). *AIP (American Institute of Physics) Conference Proceedings;* **145**: No. 1, 199-205(20 Jul 1986). (CONF-8504161—).

From Workshop on polarized antiproton sources; Bodega Bay, CA, USA (18 Apr 1985).

An analytic solution which will determine the number of Siberian snake needed for spin transperency of high energy beams in cyclic accelerators is sought. An algorithm for the spin transfer matrix is developed and applied to find the spin precession frequency for a specific number of snakes.

50103 **Field energy and RMS emittance in intense particle beams.** Wangler, T.P.; Crandall, K.R.; Mills, R.S.; Reiser, M. (MS H817, Los Alamos National Laboratory, Los Alamos, NM 87545). *AIP (American Institute of Physics) Conference Proceedings;* **139**: No. 1, 133-152(25 Apr 1986). (CONF-8505164—).

From Workshop on high brightness, high current, high duty factor ion injectors; San Diego, CA, USA (21 May 1985).

An equation is presented for continuous beam with azimuthal symmetry and continuous linear focusing; the equation expresses a relationship between the rate of change for squared rms emittance and the rate of change for a quantity we call the nonlinear field energy. The nonlinear field energy depends on the shape of the charge distribution and corresponds to the residual field energy possessed by beams with nonuniform charge distributions. The equation can be integrated for the case of an rms matched beam to yield a formula for space-charge-induced emittance growth that we have tested numerically for a variety of initial distributions. The results provide a framework for discussing the scaling of rms emittance growth and an explanation for the well-established lower limit on output emittance.

50104 **Nonlinear problems in accelerator physics.** Peggs, S.G.; Talman, R.M. (Superconducting Super Collider Central Design Group, Lawrence, Berkeley Laboratory, Berkeley, California 94720). *Annual Review of Nuclear Science;* **36**: No. 1, 287-325(1986).

The Hamiltonian formulation is used to describe various nonlinear processes in accelerators. Topics include resonance, distortion functions, and the beam—beam problem. (AIP)

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 49469, 50083, 50087, 50100, 50101, 50102, 50386, 50698

50105 (IAEA-TECDOC—410, pp 278-284) **Be(d,n) source at a modest facility.** Smith, A.B.; Smith, D.L.; Whalen, J.F. (Argonne National Lab., IL, USA). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Source characterization for deuteron energies less than 8 MeV is discussed including: intensity, spectrum and angular distributions. Pulsed and steady-state applications of the source to the acquisition of fast-neutron data are illustrated by energy-averaged neutron total cross-section and spectrum-averaged activation cross-section measurements. Source utilization, measurement techniques, and experimental results are described with attention to self-shielding effects, background suppression and specification of uncertainties. These illustrations are extrapolated to broader-scope studies, taking advantage of the high fast-neutron intensities. The present and future potential is determined more by detection capability than by source properties. 19 refs, 9 figs.

50106 (IAEA-TECDOC—410, pp 274-278) **Target scattering in the production of monoenergetic neutrons at accelerators.** Lesiecki, H.; Cosack, M.; Siebert, B.R.L. (Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, F.R.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

When monoenergetic neutrons are produced at accelerators, a contribution of neutrons scattered from the target backing and the vacuum chamber must be taken into account. Monte Carlo calculations and time-of-flight experiments were carried out for the quantitative determination of the spectral distribution of the fluences of scattered neutrons. 10 refs, 7 figs, 1 tab.

50107 (IAEA-TECDOC—410, pp 285-289) **Updating survey of some less common fast neutron sources: /sup 9/Be(p,n)/sup 9/B, /sup 11/B(p,n)/sup 11/C, /sup 51/V(p,n)/sup 51/Cr and /sup 9/Be(α,n)/sup 12/C.** Drosg, M. (Vienna Univ., Austria. Inst. fuer Experimentalphysik). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Production of fast neutrons by the reactions /sup 9/Be(p,n)/sup 9/B, /sup 11/B(p,n)/sup 11/C, /sup 51/V(p,n)/sup 51/Cr and /sup 9/Be(α,n)/sup 12/C is surveyed with an upper neutron energy limit of about 30 MeV. More recent cross section measurements are included into the data base and their impact on the results of previous reviews is investigated. Besides the use of /sup 1/H(/sup 11/B,n)/sup 11/C as a monoenergetic source for 11.4 MeV neutrons

and as a two-line source between 11.9 and 20.6 MeV is discussed. 44 refs, 2 figs, 3 tabs.

50108 (IAEA-TECDOC—410, pp 290-296) **Neutron source for 3-25 MeV energy range based on EGP-10M accelerator and gas tritium target.** Lovchikova, G.N.; Salnikov, O.A.; Simakov, S.P.; Trufanov, A.M.; Polyakov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The report describes the design and operating principle of a gas tritium target installation on the EGP-10M FEI pulsed accelerator. Neutron fluxes in the energy range of 3-8 MeV in the /sup 3/H(p,n)/sup 3/He reaction and in the energy range of 20-25 MeV in the /sup 3/H(d,n)/sup 4/He reaction are being obtained with the help of this target. The basic physical neutron flux parameters, from a target, the comparison with a solid tritium target and the examples of using a gas target in neutron experiments are given. 16 refs, 6 figs, 1 tab.

50109 (IAEA-TECDOC—410, pp 296-301) **Investigations on the properties of D+D and D+T neutron sources.** Csikai, J.; Lantos, Z.; Buczko, C.M. (Kossuth Lajos Tudomanyegyetem, Debrecen, Hungary. Kiserleti Fizikai Intezet). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Simple analytical expressions are given for the calculation of the energy and angular distributions of neutrons emitted in the reactions /sup 2/H(d,n)/sup 3/He and /sup 3/H(d,n)/sup 4/He for the 20-500 keV deuteron energy range. The results obtained were compared with the measured and calculated thin and thick target energy and angular distributions of D+T neutrons at 75, 125, 150, 175 and 210 keV deuteron energies. The energy spread of D+T neutrons as functions of emission angle and deuteron energy is also given for thick TiT target. 6 refs, 6 figs, 6 tabs.

50110 (IAEA-TECDOC—410, pp 301-302) **Deuterium generator for gas target.** Goverdovskij, A.A.; Gordyushin, A.K.; Mitrofanov, V.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The device filling gas targets with deuterium is described. The working substance of the device is titanium powder. The tests of the device have shown that the gas coming out of the powder does not contain impurities. 2 refs, 1 fig.

50111 (IAEA-TECDOC—410, pp 313-325) **Integral studies by 14 MeV neutron sources.** Sumita, K. (Osaka Univ., Suita, Japan. Faculty of Engineering). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

In these five years, the integral studies by D-T Neutron Source were carried out mainly to resolve the problems of fusion reactor neutronics. In addition to RTNS-I, OKTAVIAN, FNS and LOTUS were newly built for this area. Recent remarkable progresses in several fusion neutronics integral experiments are introduced here as well as to the neutron source properties and experimental methods. Those new machines have the very similar neutron intensity of 5x10/sup 12/n/s order, and proved that their neutron intensities were enough to resolve the problems concerned with neutron spectrum. However, to measure the Tritium Breeding Ratio directly, it may be helpful for use to have higher intensity with nearly point-source characteristics. RTNS-II with the highest D-T neutron intensity of 6 x 10/sup 13/n/s has mainly served for the fundamental studies of radiation damage, however, it has been sometimes very useful for fusion neutronics integral experiments. 31 refs, 18 figs, 2 tabs.

50112 (IAEA-TECDOC—410, pp 326-334) **Basic and applied studies with modest 14 MeV facilities.** Vonach, H. (Vienna Univ., Austria. Inst. fuer Radiumforschung und Kernphysik). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Properties and applications of modest (total neutron production <10/sup 11//sec) 14 MeV facilities are discussed in detail. In addition to neutron generator and tritium target properties the discussion includes the problems of laboratory design, shielding radiation safety and the properties and quality of the neutron field which can be produced with such machines. Application to basic nuclear physics, measurement of nuclear data for fusion and radiobiology to activation analysis and some more special subjects like fusion diagnostics or calibration of neutron detectors are discussed in some detail. Some important applications such as integral studies for fusion and to geophysical problems - especially addressed in some other talks of this meeting - are mentioned very briefly only. 25 refs, 8 figs.

50113 (IAEA-TECDOC—410, pp 335-346) **Techniques for 14 MeV source utilization.** Seeliger, D. (Technische Univ., Dresden, German Democratic Republic). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

This review considers recent development of those techniques which are used for the utilization of DT-neutron generators usually not being a part of commercially delivered low voltage accelerators. Such techniques are needed for maintaining a high stability of operation, high quality of experiments, radiation protection and flux monitoring. Moreover, a few modern techniques for the utilization of neutron generators in nuclear data measurements are presented. 57 refs, 18 figs.

50114 (IAEA-TECDOC—410, pp 351-356) **Status of the Bratislava multipurpose neutron source.** Pivarc, J.; Hlavac, S.; Matousek, V.; Lorencz, R.; Dostal, L. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

A multipurpose D+T neutron source, based on a 20 mA duoplasmatron ion source and a 300 kV/40 mA high voltage power supply, under construction at the Institute of Physics in Bratislava, is described. Its basic purpose is to produce intense and pulsed beams of 14 MeV neutrons. The intense section of the source is expected to produce continuously 10/sup 12/ ns/sup -1/ with a rotating TiT target. The low current dc section is designed to produce continuously 10/sup 10/ ns/sup -1/ and the fast pulsed section will be capable of generating a compressible D/sup +/ ion beam of a length of 2 ns on a target spot with about 10/sup 3/ neutrons per pulse. The source components are designed to give high reliability with little maintenance in order to minimize the radiation hazard in view of the extreme concentration of radioactive tritium. 8 refs, 9 figs.

50115 (IAEA-TECDOC—410, pp 356-364) **Rotating targets for intense 14 MeV neutron sources.** Pivarc, J. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

A survey of rotating target systems used for the production of 14 MeV neutrons by intense ion beam is given. Attention is paid to tritium losses from targets, their reduction and the safe operation of intense neutron sources. Also discussed are additional requirements necessary to be satisfied so that higher fluxes than 10/sup 12/

ns/sup -1/ from the D-T reaction may be obtained. 32 refs, 10 figs, 1 tab.

50116 (IAEA-TECDOC—410, pp 365-367) **Intense 14 MeV neutron generator.** Dekhtyar, M.I.; Maydanyuk, V.K.; Neplyuev, V.M.; Primenko, G.I.; Sedov, Yu.A.; Strizhak, V.I.; Tarakanov, V.K. (Ukrainian Academy of Sciences, Kiev. Inst. of Nuclear Physics). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

An experimental generator of fast neutrons via T(d,n)/sup 4/ He reaction is described. Neutron yield of 5.10/sup 11/ neutron-center dots/sup -1/ is achieved. 2 figs.

50117 (IAEA-TECDOC—410, pp 367-368) **Pulsed 14 MeV neutron source.** Bobyr, V.V.; Bordulya, A.P. (Kievskij Gosudarstvennyj Univ., Ukrainian SSR). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

This paper deals with pulsed 14 MeV neutron sources. Time length is within 2 mks to 10 min. 1 ref.

50118 (IAEA-TECDOC—410, pp 369-379) **Intense neutron generator development at the Technical University Dresden.** Eckstein, P.; Jahn, U.; Paffrath, E.; Schmidt, D.; Seeliger, D. (Technische Univ., Dresden, German Democratic Republic). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

A Cockroft-Walton type accelerator producing low-energy intense hydrogen ion beams is presented. This accelerator is aimed for the production of monoenergetic neutron beams by the DD- and DT-reactions. So far, ion currents up to 25 mA at a maximum of 240 keV energy have been obtained. 14 refs, 10 figs.

50119 (IAEA-TECDOC—410, pp 396-408) **Spallation sources for neutron nuclear physics.** Bowman, C.D. (Los Alamos National Lab., NM, USA). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

New intense pulsed spallation neutron sources have come on line within the past few years at the Argonne National Laboratory, the KEK Laboratory, the Rutherford-Appleton Laboratory, and the Los Alamos National Laboratory. While the construction of new spallation sources is driven primarily by condensed matter physics studies using thermal and epithermal neutrons, these sources also may provide excellent opportunities for neutron nuclear physics research. Essentially all spallation sources produce microsecond wide bursts for work in the keV region and below and offer the potential to produce intense sources of nanosecond-wide neutron bursts for the MeV range. The useful spectrum runs potentially from 10/sup -7/ to 10/sup +9/ eV if full advantage is taken of spallation source technology. The properties of the source configuration used throughout this energy range are discussed and illustrated using the Los Alamos Proton Storage Ring (PSR) Facility as an example. The primary impact of the spallation neutron source is an intensity gain often several orders of magnitude over existing neutron source technology. The new neutron physics possible is discussed in some depth and illustrated with the first examples of measurements over much of the energy range. Finally, future prospects are described promising, for the foreseeable future, increases in intensity of perhaps an order of magnitude beyond present technology. 36 refs, 11 figs, 1 tab.

50120 (INIS-BR—688, pp 239) **Development of a polarization circuit for an electron gun which will be used in Linear Accelerator of the IFUSP (Institute of Physics of Sao Paulo University) and in the confinment ring injector of the National Radiation Synchrotron Laboratory.** Bonini, A.L.; Dyrjawoj, J.B. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50121 **Shielding design at Fermilab: Calculations and measurements.** Cossairt, J.D. (Fermi National Accelerator Lab., P.O. Box 500, Batavia, IL 60510). pp 642-658 of Health physics of radiation generating machines 20th midyear topical symposium. Swanson, W.P.; Busick, D.D. Springfield, VA; National Technical Information Service (1987). (CONF-870219—).

From 20. midyear topical symposium of the Health Physics Society: health physics of radiation-producing machines; Reno, NV, USA (8 Feb 1987).

The development of the Fermilab accelerator complex during the past two decades from its original concept as the "200 BeV accelerator" to that of the present Tevatron, designed to operate at energies as high as 1 TeV, has required a coincidental refinement and development in methods of shielding design. In this paper the author describes these methods as used by the radiation protection staff of Fermilab. This description reviews experimental measurements which substantiate these techniques in realistic situations. Along the way, observations will be stated which likely are applicable to other proton accelerators in the multi-hundred GeV energy region, including larger ones yet to be constructed.

50122 **Unique radiation problems associated with the SLAC Linear Collider.** Jenkins, T.M.; Nelson, W.R. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). pp 621-641 of Health physics of radiation generating machines 20th midyear topical symposium. Swanson, W.P.; Busick, D.D. Springfield, VA; National Technical Information Service (1987). (CONF-870219—). Contract AC03-76SF00515.

From 20. midyear topical symposium of the Health Physics Society: health physics of radiation-producing machines; Reno, NV, USA (8 Feb 1987).

The SLAC Linear Collider (SLD) is a variation of a new class of linear colliders whereby two linear accelerators are aimed at each other to collide intense bunches of electrons and positrons together. Conventional storage rings are becoming ever more costly as the energy of the stored beams increases such that the cost of two linear colliders per GeV is less than that of electron-positron storage rings at c.m. energies above about 100 GeV. The SLC being built at SLAC is designed to achieve a center-of-mass energy of 100 GeV by accelerating intense bunches of particles, both electrons and positrons, in the SLAC linac and transporting them along two different arcs to a point where they are focused to a small radius and made to collide head on. The SLC has two main goals. The first is to develop the physics and technology of linear colliders. The other is to achieve center-of-mass energies above 90 GeV in order to investigate the unification of the weak and electromagnetic interactions in the energy range above 90 GeV; (i.e., Z^0, etc.). Also discussed are a few of the special problems that were encountered by the Radiation Physics group at SLAC during the design and construction of the SLAC Linear Collider. The nature of these problems is discussed along with the methods employed to solve them.

50123 **Polarized protons from the source to 70 GeV.** Makdisi, Y.I. (Brookhaven National Laboratory, Upton, New York 11973). *AIP (American Institute of Physics) Conference Proceedings;* **145**: No. 1, 82-88(20 Jul 1986). (CONF-8504161—).

From Workshop on polarized antiproton sources; Bodega Bay, CA, USA (18 Apr 1985).

This energy range covers the current project at the AGS and extends well beyond it. I shall report on our learning experience at BNL, discuss the potential for improvement, and the limita-

tions of extending the AGS resonance jumping technique beyond 25 GeV.

50124 Calculation of spin depolarizing resonance strength. Courant, E.D.; Lee, S.Y.; Tepikian, S. (Brookhaven National Laboratory, Upton, NY 11973). *AIP (American Institute of Physics) Conference Proceedings;* **145**: No. 1, 174-184(20 Jul 1986). (CONF-8504161—).

From Workshop on polarized antiproton sources; Bodega Bay, CA, USA (18 Apr 1985).

Cyclotron resonances and their effects upon polarized beams in cyclic hadron accelerators (beam energies from 70 GeV up to 20 TeV) are discussed.

50125 High-brightness, high-current ion sources. Keller, R. (MS H816, Los Alamos National Laboratory, Los Alamos, NM 87545). *AIP (American Institute of Physics) Conference Proceedings;* **139**: No. 1, 1-16(25 Apr 1986). (CONF-8505164—).

From Workshop on high brightness, high current, high duty factor ion injectors; San Diego, CA, USA (21 May 1985).

Several existing high-current dc ion sources are presented that yield positive ions and are based on gas discharges. Their common features are then outlined: extraction systems, required plasma qualities, and the production of ions from solid materials. Finally, from well-established laws, scaling rules for high-brightness ion beams are derived taking one specific case to determine the numerical constants. These rules predict that the current values of transportable beams scale proportionally to the 3/2 power of the extraction voltage, whereas the brightness strongly decreases with rising voltage.

4304 Storage Rings

REFER ALSO TO CITATION(S) 50102, 50120, 50124, 50364

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 49459, 49460, 50281, 50297, 50411, 50511, 50566, 50571, 50580, 50581, 50582, 50697, 50721, 50732, 50753

50126 (CERN-EP—86-113) Silicon detectors in electromagnetic and hadronic calorimetry. Rancoita, P.G.; Seidman, A. (Istituto Nazionale di Fisica Nucleare, Milan (Italy); European Organization for Nuclear Research, Geneva (Switzerland)). 20 Aug 1986. 30p. (CONF-8606240—4). NTIS (US Sales Only), PC A03/MF A01. File Number DE88900032.

From 3. Pisa meeting on advanced detectors; Pescaia, Italy (2 Jun 1986).

A review of investigations performed by the SICAPO collaboration at CERN on Si/W and Si/U sandwich calorimeters employing silicon detectors as active medium, is presented. Experimental results, such as the response of sensed energy versus incoming electron energy and depleted layer width, of the longitudinal and lateral development of electromagnetic showers and of the energy resolution, are given. Mosaic modules of silicon detectors, which enable the construction of silicon sampling hadronic calorimeters, are also described. A comparison of results from SICAPO, Hamburg (Si/Pb), and Tokyo (Si/Pb and Si/W) calorimeters is shown.

50127 (CERN-EP—87-78) The UA2 experiment at ACOL. Booth, C.N. (European Organization for Nuclear Research, Geneva (Switzerland)). 13 Apr 1987. 39p. (CONF-8606286—2). NTIS (US Sales Only), PC A03/MF A01. File Number DE88900040.

From 6. international conference on proton-antiproton physics; Aachen, F.R. Germany (30 Jun 1986).

The UA2 apparatus is undergoing a substantial upgrade to enhance its performance in readiness for the higher luminosity to be provided by ACOL. An overview of the detector is presented, with particular emphasis on novel techniques employed in sections of the central detector. The construction of a scintillating fiber tracking detector is examined in some detail. Provisional results of test-beam calibrations are also discussed.

50128 (CERN-EP—87-89) Fast tracking detector using the multidrift tubes. Bouclier, R.; Charpak, G.; Erskine, G.A.; Guerard, B.; Santiard, J.C.; Sauli, F.; Solomey, N. (European Organization for Nuclear Research, Geneva (Switzerland)). 12 May 1987. 19p. (CONF-8703128—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE88900030.

From International conference on advances in experimental methods for colliding beam physics; Stanford, CA, USA (9 Mar 1987).

We describe a tracking detector designed as an assembly of multidrift tube modules; because of its fast time-resolution and good position accuracy, coupled with high reliability, the device seems suitable for operation as vertex detector at a collider, and for other high-rate applications. Recent measurements of localization accuracy obtained when operating the modules with a dimethyl ether gas filling are presented.

50129 (CONF-871101—8) General theoretical foundation of the ^{252}Cf source noise method. Difilippo, F.C. (Oak Ridge National Lab., TN (USA)). Jun 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87010890.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The measurement of reactivities by the ^{252}Cf source noise technique in complicated geometries and/or highly subcritical states requires a general and solid theoretical foundation of the method in order to translate the experimental observables into the multiplication constant. Models based on the absolute dominance of the fundamental mode can not be applied when complications due to the geometry or the loading preclude the ideal positioning of sources and detectors. Spatial effects can have considerable effects on this method as it can be appreciated using a simple two-points reactor model. A derivation of a general interpretation of the ^{252}Cf method is then necessary. 5 refs.

50130 (CRN-PN—86-15) Alpha spectroscopy applied to the search of trace amounts and to the identification of nuclei produced by nuclear reactions. Ramanantsizehena, G. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1986. 168p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE87752809.

In order to increase the sensitivity of an α-particle spectrometer, its background has been lowered. This has been achieved by using radioactivity-free materials and by reducing the effects of cosmic rays. This set up allowed to confirm the presence of unidentified α-emitting elements in minerals originating from the South-East of Madagascar. Using chemical separations, the half-life of one α-particle group, having an energy of 8.89 MeV, has been measured as 15.0+-2.5 h. Alpha-ray spectroscopy has also been applied in a fusion-evaporation reaction, to determine the optimal energy for forming the nucleus /sup 219/Ac. Then, a γ ray experiment identified the γ-ray transitions in /sup 219/Ac and established their relative ordering in the decay scheme.

50131 (DOE/ER/03130—31) Detection of solar neutrinos in superfluid helium. Lanou, R.E.; Maris, H.J.; Seidel, G.M. (Brown Univ., Providence, RI (USA). Dept. of Physics). Jan 1987. Contract AC02-76ER03130. 12p. (CONF-870190—1; COO—3130TC-31). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014478.

From Astro-particle physics workshop; Aspen, CO, USA (24 Jan 1987).

A new method for detecting solar neutrinos and other weakly interacting particles is proposed and described. The detector consists of a large mass of superfluid helium at low temperatures (20 mK). When a neutrino is scattered off an electron, the recoil energy of the electron (10^{-6} to 10^{-7} ergs) is deposited in the helium. This small amount of energy can be detected because of the

unusual kinetics of rotons at low temperatures. It should be possible to construct a detector of sufficiently low background and large size to measure solar neutrino spectra. 29 refs., 2 figs.

50132 (IAEA-TECDOC—410, pp 107-114) **Neutron detector calibration using associated particle method.** Moschini, G.; Chendi, L.; Cherubini, R. (Istituto Nazionale di Fisica Nucleare, Padua, Italy). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The Associated Particle Technique (A.P.T.) had been used with neutrons from the D(d,n)/sup 3/He and T(d,n)/sup 4/He reactions to the absolute neutron detection efficiency of an 1.27 x 3.81cm/sup 2/ Stilbene scintillator as function of the light collection threshold and the neutron kinetic energy in the energy range 2/18 MeV. Thin Ti-T and home made deuterated polyethylene targets have been used. The A.P.T. chamber description, the measurements and the comparison with both analytical and Montecarlo (SAN-REMO code) calculations are reported. 9 refs, 11 figs, 2 tabs.

50133 (IAEA-TECDOC—410, pp 346-350) **Associated particle method for 14 MeV neutron data measurement.** Yuan Hanrong. (Academia Sinica, Beijing, BJ, China. Inst. of Atomic Energy). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The application of associated particle method for 14 MeV neutron data measurement is discussed. The improvements of the AEP associated particle type fast neutron TOF spectrometer are presented. A new AEP value of 2.078 +- 0.040 b for the fission cross section of /sup 235/U induced by 14.2 MeV neutrons using the time correlated associated particle method is given and the "back-to-back" TCAP method for direct measurement of fission cross section ratio of /sup 238/U to /sup 235/U is described. In the latter experiment a "correlated neutron beam wrapping up samples" geometry has been adopted to eliminate the effect of the ununiformity of the samples. The initial experimental results indicate that this method is feasible. 13 refs, 4 figs, 2 tabs.

50134 **(INIS-BR—685) Study and construction of a new type of gaseous scintillator.** Khoury, H.J. (Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1978. 83p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703445.

The characteristics and constructional details of a new type of gas scintillation counter is presented. It is shown that using an electric field in a cylindrical geometry and operating the counter in a proportional region, the number of photons due to the excitation of rare gas (argon) during the passage of an ionising primary particle, is considerably increased. The effect of the intensity of applied eletric field is discussed and it is shown that the use of suitable electric field improves the resolution of scintillation counter. The use of several Waveshifters for shifting the ultraviolet component of photon spectrum into the sensitive region of the photomultiplier tube is discussed and the experimental results are presented. A source of Am /sup 241/ was used to verify the influence of electric field on alpha spectra.

50135 **(INIS-BR—686) Project and construction of a digital chronoanalyser.** Cavalcante, M.A. (Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1983. 85p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703446.

The project, the construction and the operation tests of a new electronic system for measuring half-lives of nuclear excited states in the range from 10/sup -7/ to 10/sup -5/ seconds are presented. The proposed method uses logic circuits of the TTL family. The time scale is obtained from a phase locked-loop quartz oscillator; the formation instant of excited state of interest is obtained by JK flip-flop through its .negative transition edge. This system uses ten channels of frequency counters, controlled by logic gates, to measure successively gamma rays emitted between the instant of birth of an excited state and its de excitation time. The performance of system was verified by gamma ray decay from /sup 137/Cs and /sup 60/Co.

50136 (INIS-BR—688, pp 245) **Time of flight detector for heavy ions.** Guimaraes, V.; Carlin Filho, N.; Coimbra, M.M.; Added, N.; Szanto, E.M.; Toledo, A.S. de; Pena-Brage, J.A.; Silva Figueira, M.C. da. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50137 (INIS-BR—688, pp 243) **Application of the Wiener filter in neutrongraphy.** Crispim, V.R.; Rogers, J.D. (Rio de Janeiro Univ., Brazil. Coordenacao dos Programas de Pos-graduacao de Engenharia). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50138 (INIS-BR—688, pp 244) **Experimental results of the gas E-ΔE position sensitive detector.** Faro, L.B.C.W. de; Koide, K.; Dietzsch, O.; Takai, H.; Bairrio Nuevo Junior, A. (Sao Paulo Univ., Brazil. Inst. de Fisica; Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50139 (INIS-BR—688, pp 252) **Dynamic termination for slowing-down length.** Pacheco, J.G.; Koide, K.; Faro, L.B.C.W. de; Takai, H.; Bairrio Nuevo Junior, A. (Sao Paulo Univ., Brazil. Inst. de Fisica; Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50140 **(INIS-BR—690) Project and construction of a measurement system and nuclear radiations analysis.** Castro, R.B. de. (Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1983. 156p. (In Portuguese). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703450.

A counting system was designed and built, aiming to: detect and measure nuclear radiations using a Geiger-Mueller counter; and to measure the amplitudes of pulses from either a proportional or a NaI detector. The results obtained of the Cs-137 and Co-60 energy spectra were compared with results obtained from other researches.

50141 **(INIS-BR—692) Compton current detector.** Carvalho Campos, J.S. de. (Sao Paulo Univ., Sao Carlos, SP (Brazil). Inst. de Fisica e Quimica). 1984. 83p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703452.

The project and construction of a Compton current detector, with cylindrical geometry using teflon as dielectric material; for electromagnetic radiation in range energy between 10 KeV and 2 MeV are described. The measurements of Compton current in teflon were obtained using an electrometer. The Compton current was promoted by photon flux proceeding from X ray sources (MG 150 Muller device) and gamma rays of /sup 60/Co. The theory elaborated to explain the experimental results is shown. The calibration curves for accumulated charge and current in detector in function of exposition rates were obtained. (M.C.K.).

50142 **(INIS-BR—693) Thermoluminescence and their applications.** Rodrigues, G.V. (Pernambuco Univ., Recife (Brazil). Dept. de Energia Nuclear). 1986. 51p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703453.

The theory involved in the phenomenon of thermoluminescence emission, the characteristics of the main thermoluminescent phosphorus and some of their applications are presented. Some of the main thermoluminescent dosemeters used in dosimetry are described. (M.C.K.).

50143 (INIS-BR—696, pp 64) **Archytecture of the Sao Carlos 2.0 tesla NMR tomograph.** Tannus, A.; Torre Neto, A.; Martins, M.J.; Bonagamba, T.J.; Beckmann, N.; Slaets, J.; Panepucci, H.C. (Sao Paulo Univ., Sao Carlos, SP, Brazil. Inst. de Fisica e Quimica). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

50144 **(INIS-BR—731) Construction of a thimble ionization chamber.** Rodrigues, L.N.; Ramos, M.M.O.; Cardoso, D.O.; Pinto, R.A.S.; Almeida, C.E. de. (Sociedade Brasileira de Fisica, Rio de Janeiro). 1985. 4p. (In Portuguese). (CONF-8508241—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703483.

From 8. workshop on nuclear physics; Sao Lourenco, MG, Brazil (31 Aug 1985).

A thimble ionization chamber was developed at Instituto de Radioprotecao e Dosimetria to supply the internal market. The chamber characteristics are the following: 1 - sensitive volume of 0.6 cm/sup 3/; 2 - 0.07 cm thick air equivalent plastic (SHONKA A-150) wall; 3 - 0.45 cm thick Plexiglass build-up cap; 4 - electrode and stem made of 99.5% pure Aluminium; 5 - PTFE insulators which warrant low leakage current. The chamber is connected to a Keithley 616 electrometer through a triaxial cable and a -300 V voltage source supplies the needed operation tension. Preliminary tests showed the following results: 1 - maximum energy dependence of 17% at 29 KeV X ray filtered radiation relative to /sup 60/Co response; 2 - maximum angular dependence of 20%; 3- stem effect of 0.8%; 4 - leakage current of 10/sup -14/ A; 5 - reproducibility of 0.03% for /sup 60/Co and 0.1% for X ray beam.

50145 (INIS-BR—794, pp 8) **Individual monitors with thermoluminescent dosemeters of LiF and CaSO/sub 4/.** Luporini Segundo, S.; Crestana, S.; Mascarenhas, S.R. (SAPRA - Servico de Assessoria e Protecao Radiologica, Sao Carlos, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

50146 (INIS-BR—794, pp 6) **Difference between the mechanisms of peak formation of dosimetric TL (5) and 6 and 7 of TLD-100.** Rosa, L.A.R. da; Caldas, L.V.E. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

50147 (INIS-BR—794, pp 4) **Development and adaptation of new detectors for using in exposure control and radiological images.** Pela, C.A.; Ghilardi Netto, T. 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

50148 **(INIS-BR—798) Difference between the mechanisms of peak formation of dosimetric TL(5) and 6 and 7 of TLD-100.** Rosa, L.A.R. da; Caldas, L.V.E. (Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro). 1986. 8p. (In Portuguese). (CONF-8607341—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703541.

From Symposium on Medical Physics Esther Nunes Pereira; Curitiba, Brazil (9 Jul 1986).

It is studied the best model to explain the peak formation of TL 5,6 and 7 of TLD-100. The mission curves of the irradiated material were compared at environmental temperature and at 77/sup 0/K. (E.G).

50149 **(INIS-BR—799) Dosimetric lithium fluoride production.** Campos, L.L. (Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro). 1986. 7p. (In Portuguese). (CONF-8607341—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703542.

From Symposium on Medical Physics Esther Nunes Pereira; Curitiba, Brazil (9 Jul 1986).

The dosimetric properties of the lithium fluoride pellets using a thermoluminescent dosemeter, with two filters. (E.G.).

50150 **(INIS-BR—835) Energy dependence of different beta radiation detectors.** Albuquerque, M.P.P.; Xavier, M.; Caldas, L.V.E. (Sociedade Brasileira de Fisica, Sao Paulo). 1987. 9p. (In Portuguese). (CONF-8705181—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703731.

From 10. national meeting on condensed matter physics; Caxambu, Brazil (5 May 1987).

The beta radiation secondary standard of the Calibration Laboratory of Sao Paulo was used for the energy dependence determination of the main radiation monitoring instruments. Calibrated S/sup 90/R + /sup 90/Y, /sup 204/Tl and /sup 147/Pm sources constitute this secondary standard. Portable Geiger-Mueller type instruments, cylindrical ionization chambers, alarm pocket dosemeters, as well as parallel-plates ionization chambers, were studied in relation to beta radiation. The results were compared with those obtained with the extrapolation chamber (that is the reference instrument for beta radiation detection) and with thermoluminescent dosemeters of CaSO/sub 4/: Dy.

50151 **(INIS-BR—836) Development of thin dosemeters of CaSO/sub 4/: Dy for beta radiation detection.** Campos, L.L. (Sociedade Brasileira de Fisica, Sao Paulo). 1987. 6p. (In Portuguese). (CONF-8705181—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703732.

From 10. national meeting on condensed matter physics; Caxambu, Brazil (5 May 1987).

Thin pellets of CaSO/sub 4/: Dy (0,20mm) were produced and tested in beta radiation fields. The Thermoluminescent (TL) characteristics studied were sensitivity, reproducibility, lower detection limit, linearity of TL response with absorved dose energy dependence. The results show the usefulness of this thin pellets in beta radiation detection.

50152 (INIS-BR—838, pp 11) **Automatic counting of track detectors.** Paschoa, A.S.; Mafra, O.Y. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica; Centro de Informacoes Nucleares, Rio de Janeiro, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50153 (INIS-BR—838, pp 17) **New system of photographic dosimetry of Radiation Protection and Dosimetry Institute (IRD-CNEN).** Mota, H.C.; Sigaud, G.M.; Cunha, P.G. da. (Instituto de Radioprotecao e Dosimetria, Rio de Janeiro, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50154 (INIS-BR—838, pp 80) **Gamma-gamma angular correlation spectrometer-Automation-II.** Saito, J.H.; Rossi, J.C.; Souza, M.O.M.D. de. (Sao Carlos Univ., Brazil. Dept. de Fisica; Sao Carlos Univ., Brazil. Dept. de Computacao e Estatistica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50155 (INIS-BR—838, pp 1) **Fabrication of prototypes of Ge(Li) semiconductor detectors.** Santos, W.M.S.; Marti, G.V.; Rizzo, P.; Barros, S. de. (Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50156 (INIS-BR—838, pp 5) **Project and construction of an alcohol Geiger-Mueller detector.** Cardoso, D.O.; Rodrigues, L.N.; Ramos, M.M.O. (Instituto de Radioprotecao e Dosimetria, Rio de Janeiro, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50157 (INIS-BR—838, pp 7) **Determination of the curve of emitted light for protons of the NE-213 detector (1.5" x 1.5").** Silva, A.A. da; Suita, J.C.; Auler, L.T.; Antunes, L.J.; Silva, A.G. da; Cabral, S.C.; Klein, H. 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50158 (INIS-BR—838, pp 14) **Construction of a magnetometer.** Emediato, L.G.R.; Cybulska, E.W.; Ribas, R.V.; Figueiredo, C.M. de. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50159 (INIS-BR—838, pp 45) **Absolute measurement of Cd-109 disintegration rate.** Dias, M.S.; Koskinas, M.F. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50160 (INIS-BR—838, pp 47) **Technique of double neutron-gamma discrimination for neutron double-differential spectra measurements.** Silva, A.G. da; Auler, L.T.; Suita, J.C.; Antunes, L.J.; Silva, A.A. da. (Instituto de Engenharia Nuclear, Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50161 (INIS-BR—838, pp 50) **Development of the technique of photoproton and photoalpha detection in CR-39.** Franco, M.A.R.; Herdade, S.B.; Oliveira, W.A. de; Goncalez, O.L. (Sao Paulo Univ., Brazil. Inst. de Fisica; Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50162 (INIS-BR—838, pp 82) **Environmental contamination by natural radioactivity.** Hadler Neto, J.C.; Paulo, S.R. de. (Universidade Estadual de Campinas, Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50163 (INIS-mf—10697) **Development and use of various position sensitive proportional counters for the X-ray structure analysis of biological objects.** Rohm, K.J. (Heidelberg Univ. (Germany, F.R.). Naturwissenschaftlich-Mathematische Gesamtfakultaet). 1985. 172p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87752884.

The quantum yield of position sensitive detectors for X-rays was increased by over 50% by increasing the pressure of the counter gas. The anode impulse was thereby slowed down and the cathode impulse was made smaller in that the 'noise' of the electronics determined local resolution. With high pressure and relatively thick anodes an alternate form of the gas amplification is stable. This 'self-quenching streamer mode' (SQS-mode) distinguishes itself by large and regular anode impulses and makes the operation of the detectors with good spatial resolution possible. It is also well suited in other aspects for spatial resolving detectors. Detectors were also developed for use in single crystal diffractometry and small angle scattering. The technical part of the construction of a diffractometer with a spatial resolving detector is settled, as is well known. After completion of the crystalographic part test measurements can supposedly begin in the fall of this year. A measurement station for small angle scattering was constructed. The data is stored directly in the computer, measurement and evaluation occur in suited programs. Statistical and time-resolved measurements of small angle scattering of muscle fibers were conducted. Examples are discussed in this work.

50164 (SI—86-13) **Principles and new developments of semiconductor radiation detectors.** Walenta, A.H. (Siegen Univ. (Gesamthochschule) (Germany, F.R.)). 1986. 53p. (CONF-8603109—8). NTIS (US Sales Only), PC A04/MF A01. File Number DE88900063.

From 4. European symposium on semiconductor detectors; Munich, F.R. Germany (3 Mar 1986).

The physics aspects of semiconductor radiation detectors are briefly reviewed. A comparison with other radiation detectors in particular with wire chambers shows the unique features of the advanced semiconductor detectors of high density, high ionization density and the possibility of drift field shaping using space charges. Novel applications and device arrangements are discussed. 49 refs., 17 figs., 14 tabs.

50165 (UCRL—96004) **Ultrafast photoconductor radiation detectors.** Wang, C.L.; Pocha, M.D.; Morse, J.D.; Singh, M.S.; Davis, B.A. (Lawrence Livermore National Lab., CA (USA); EG and G, Inc., Las Vegas, NV (USA)). Aug 1987. Contract W-7405-ENG-48. 6p. (CONF-8708110—18). NTIS, PC A02. File Number DE87013487.

From 31. SPIE annual international technical symposium on optical and optoelectronic applied science and engineering; San Diego, CA, USA (16 Aug 1987).

We are developing and investigating homogeneous, photoconductive semiconductors as very fast radiation detectors. We irradiated GaAs, Cr-doped GaAs, and Fe-doped InP crystals with 14-MeV neutrons to produce lattice defects that act as fast-recombination centers for electrons and holes. Using short-pulse lasers and 17-MeV linear-accelerator electrons and bremsstrahlung x rays and γ rays, we have measured the temporal response and sensitivity of these photoconductors as functions of fluence ranging from 10^{12} to 10^{16} neutrons/cm^2. The carrier lifetime and mobility decrease monotonically as the neutron fluence increases, resulting in faster detector response at the expense of sensitivity. A resolving time of less than 30 ps (FWHM) was measured for the above photoconductors irradiated with $\sim 10^{15}$ neutrons/cm^2. 4 refs., 5 figs.

50166 (UCRL—96005) **Ultrafast photoconductor detector-laser-diode transmitter.** Wang, C.L.; Davis, B.A.; Davies, T.J.; Nelson, M.A.; Thomas, M.C.; Zagarino, P.A. (Lawrence Livermore National Lab., CA (USA); EG and G, Inc., Las Vegas, NV (USA); EG and G, Inc., Goleta, CA (USA)). 1987. Contract W-7405-ENG-48. 4p. (CONF-8708110—15). NTIS, PC A02. File Number DE87013803.

From 31. SPIE annual international technical symposium on optical and optoelectronic applied science and engineering; San Diego, CA, USA (16 Aug 1987).

We report the results of an experiment in which we used an ultrafast, photoconductive, radiation detector to drive a fast laser-diode transmitter. When we irradiated the neutron-damaged Cr-doped GaAs detector with 17-MeV electron beams, the temporal response was measured to be less than 30 ps. The pulses from this detector modulated a fast GaAlAs laser diode to transmit the laser output through 30- and 1100-m optical fibers. Preliminary results indicate that 50- and 80-ps time resolutions, respectively, are obtainable with these fibers. We are now working to integrate the photoconductive detector and the laser diode transmitter into a single chip.

50167 **Apparatus and method for reading two-dimensional electrophoretograms containing β-ray-emitting labeled compounds.** Anderson, H.L.; Kinnison, W.W.; Lillberg, J.W. (to Dept. of Energy, Washington, DC). US Patent 4,686,368. 11 Aug 1987. Filed date 30 Apr 1985. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

An apparatus for reading flat, substantially planar two-dimensional gel electrophoretograms containing β-ray-emitting labeled compounds, the apparatus comprising in combination: a. a single, substantially flat and rectangular proportional chamber radiation detection means substantially parallel to and approximately coextensive with the gel electrophoretogram for receiving β-rays emitted from the electrophoretogram and cosmic rays and generating electrical signals according to the two dimensional coordinates of each β-ray and cosmic ray received thereby; b. substantially flat and rectangular scintillator means located nearby to the substantially flat and rectangular proportional chamber radiation detection means for detecting the incidence of cosmic rays on the substantially flat and rectangular proportional chamber radiation detection means and having an electrical output in response thereto, yet having substantially no sensitivity to the β-rays emitted from the gel; c. magnetic field generating means for providing a substantially uniform magnetic field having dimensions substantially coextensive with the rectangular dimension of the substantially flat and rectangular proportional chamber radiation detection means and passing substantially perpendicularly therethrough and through the scintillator means.

50168 **Environmental measurements with thermoluminescence dosemeters -trends and issues.** Planque, G. de; Gesell, T.F. (Dept. of Energy, New York, NY; Dept. of Energy, Idaho Falls, ID). *Radiation Protection Dosimetry;* **17**: No. 1-4, 193-200(1986). (CONF-860806—).

From 8. international conference on solid state dosimetry; Oxford, UK (26 Aug 1986).

Progress in the application of thermoluminescence dosemeters (TLDs) to environmental measurements is examined with emphasis on the results from the series of International Intercomparisons of Environmental Dosemeters. These studies, of which eight have taken place to date, began in 1974. They now, typically, attract about 130 participating laboratories from over 30 countries and include virtually every type of TLD system currently in use for environmental measurements. Key issues associated with environmental measurements are reviewed, such as: low exposure levels, complex radiation fields (β, γ and cosmic radiation), effects of environmental insults (e.g. temperature related problems) and calibration isotopes and methods. Results from an international survey are presented showing trends in current environmental measurements programmes including the number and types of sites measured, the reasons for monitoring, the TLD systems used, and the choice of measurement quantities and units.

50169 **A silicon strip vertex detector for the MARK II experiment at the SLC.** Turala, M. (Institute for Particle Physics, Univ. of California at Santa Cruz, CA). pp 265-275 of Observable standard model physics at the SSC: Monte Carlo simulation and detector capabilities. Bengtsson, H.U.; Buchanan, C.; Gottschalk, T.; Soni, A. Teaneck, NJ; World Scientific Pub. Co. (1986). (CONF-860168—).

From Workshop on observable standard model physics at the SSC: Monte Carlo simulation and detector capabilities; Los Angeles, CA, USA (15 Jan 1986).

A brief description of the operation of silicon detectors and the basics of vertex detection are given. Experience with silicon strip detectors in fixed target experiments (NA11/NA32 at CERN SPS) is shortly presented. A proposed silicon strip vertex detector for the MARK II experiment at the SLC is described in some detail, including the physics motivation, a design, and the results of beam tests and Monte Carlo studies. Finally the extrapolation of the existing techniques to SSC detectors is given.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

50170 **(UCID—21173-Vol.1) Navy Tactical C3 EMP [Electromagnetic Pulse] Survivability Project No. S1573: Volume 1, Navy Tactical C3 EMP standards and specifications review.** Hansen, J.E.; Greenwell, R.A.; Latorre, V.R. (Lawrence Livermore National Lab., CA (USA)). 11 Sep 1987. Contract W-7405-ENG-48. 61p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000235.

This report contains a review and analysis of EMP related standards, specifications, and handbooks. Emphasis is placed on identifying those standards and specifications which are pertinent with respect to EMP. The effort is oriented to shipboard C3 systems and specifically addresses CG-47 class ships. The purpose of this analysis is to determine which documents have the potential of addressing at least one of the major EMP topics, which documents should be updated, and whether or not it is necessary to generate new documents.

50171 **(UCID—21173-Vol.2) Navy Tactical C3 EMP [Electromagnetic Pulse] Survivability Project No. S1573: Volume 2, Navy Tactical C3 EMP standards and specifications prioritization.** Hansen, J.E.; Greenwell, R.A.; Latorre, V.R. (Lawrence Livermore National Lab., CA (USA)). 1987. Contract W-7405-ENG-48. 49p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000236.

This report presents a prioritization scheme for EMP related standards, specifications, and handbooks. Emphasis is placed on identifying those documents which have already been found pertinent with regard to EMP. The effort is oriented to shipboard C3 systems and specifically addresses newer class ships. The purpose of this prioritization is to determine which documents will be most economical and advantageous to modify, and which new documents should be generated so that complete EMP related documentation is obtained. 7 refs.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 49395, 49579, 49946

50172 **(DOE/ER/10857—T3) Study of field adsorption using pulsed-laser field ion microscopy: Final technical report.** Tsong, T.T. (Pennsylvania State Univ., University Park (USA). Dept. of Physics). 22 May 1987. Contract AC02-81ER10857. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000310.

This report briefly describes development and resolution of two time-of-flight spectrometers. Also discussed is research carried out on gas molecule adsorption on metal surfaces. (JDH)

50173 (INIS-BR—688, pp 237) **Construction of a position sensitive ionization chamber.** Added, N.; Carlin Filho, N.; Coimbra, M.M.; Guimaraes, V.; Toledo, A.S. de; Szanto, E.M.; Pena-Brage, J.A. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50174 **(INIS-BR—825) Simple methodology for obtaining X-ray color images in scanning electron microscopy.** Veiga, M.M. da; Pietroluongo, L.R.V. (Sociedade Brasileira de Microscopia Eletronica, Rio de Janeiro). 1985. 9p. (In Portuguese). (CONF-8509411—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700023.

From 10. colloquium of the Brazilian Society of Electron Microscopy; Sao Paulo, Brazil (1 Sep 1985).

A simple methodology for obtaining at least 3 elements X-ray images in only one photography is described. The fluorescent X-ray image is obtained from scanning electron microscopy with energy dispersion analysis system. The change of detector analytic channels, color cellophane foils and color films are used sequentially. (M.C.K.).

50175 **(K/PS—5076) Evaluation of the Sensidyne toxic gas sensor for HF [hydrogen fluoride] vapor.** Bostick, W.D.; Angel, E.C.; Hamilton, T.H. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Sep 1987. Contract AC05-84OT21400. 37p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000647.

A diffusion-type electrochemical sensor is evaluated for the detection of hydrogen fluoride (HF) vapor, both for use as an area monitor safety device and as a stack gas monitor. Response characteristics of individual sensor assemblies are variable, but with frequent, proper calibration, the Sensidyne HF Toxic Alert device is demonstrated to provide accurate, sensitive, and relatively rapid response to this contaminant. We describe a calibration flow cell and gas permeation apparatus capable of delivering a predictable (and easily confirmed) concentration of contaminant to the sensor in a safe manner. 20 refs., 14 figs., 14 tabs.

50176 **(LA-UR—87-3305) A focussed MCP [microchannel plate] image intensifier tube for high speed gating.** Vine, B.; Yates, G. (EG and G Energy Measurements, Inc., Woburn, MA (USA); Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 9p. (CONF-8708110—20). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000480.

From 31. SPIE annual international technical symposium on optical and optoelectronic applied science and engineering; San Diego, CA, USA (16 Aug 1987).

This tube is aimed at shuttering speeds faster than 200 picoseconds, with required electrical gate pulse less than 80 volts. Similar tubes were described in a 1984 paper at this meeting. One new feature is the use of a microchannel plate (MCP) to provide high and adjustable signal gain. This tube, in comparison with proximity-focussed tubes, conserves resolution by using an electrostatic focus lens. Also new is the use of transfer photocathode technique to eliminate stray emission from the gate mesh. Measured performance: Gating speed, Gain, On-Off signal ratio will be presented. Tube construction and the transfer photocathode technique will be discussed. The noise which shows up in high-gain imaging systems will be discussed. 4 figs.

50177 **(UCID—21141) The impact of environmental factors on the performance of millimeter wave seekers in smart munitions.** Hager, R. (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014277.

An assessment has been made of the degradation in performance of horizontal-glide smart munitions incorporating millimeter wave seekers operating in three types of environments. Atmospheric effects are shown to degrade performance appreciably only in very severe weather conditions. Electromagnetic line-of-sight masking due to foliage (forest canopy and tree-lined roads) will limit submunition usage and may be a potential problem. The most serious problem involves the confident detection of military vehicles in the presence of land clutter. Standard signal processing techniques involving signal amplitude and signal averaging are not likely to be adequate for detection. Observations regarding more sophisticated techniques and the current state of research are included.

50178 **(UCRL—96239) High average power solid state laser power conditioning system.** Steinkraus, R.F. (Lawrence Livermore National Lab., CA (USA)). 3 Mar 1987. Contract W-7405-ENG-48. 6p. (CONF-8706204—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013558.

From 6. Institute of Electrical and Electronis Engineers pulsed power conference; Baltimore, MD, USA (29 Jun 1987).

The power conditioning system for the High Average Power Laser program at Lawrence Livermore National Laboratory (LLNL) is described. The system has been operational for two years. It is high voltage, high power, fault protected, and solid state. The power conditioning system drives flashlamps that pump solid state lasers. Flashlamps are driven by silicon control rectifier (SCR) switched, resonant charged, (LC) discharge pulse forming networks (PFNs). The system uses fiber optics for control and diagnostics. Energy and thermal diagnostics are monitored by computers.

50179 **(UCRL—96320) Particle velocity and stress gage measurements in spherical diverging flow.** Larson, D.B.; Stout, R.B. (Lawrence Livermore National Lab., CA (USA)). Mar 1987. Contract W-7405-ENG-48. 44p. (CONF-870637—4). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87007333.

From Summer meeting of the American Society of Mechanical Engineers; Cincinnati, OH, USA (14 Jun 1987).

Chemical explosions were used to generate spherically diverging stress waves in polymethylmethacrylate (PMMA). Piezoresistance gages of several different designs were placed in the PMMA radially from the spherical energy source. Two basic types of piezoresistance gages were used. One type was placed on backing material and then glued directly to the PMMA while the other type was placed on backing material and then enclosed in a fluid cavity which was attached to the PMMA. Gages were oriented normal to the direction of the shock front. In order to interpret the piezoresistance gage measurements and to obtain a complete set of data for numerical calculations, particle velocity was also measured at several radial positions from the explosion. In addition to different ytterbium gage designs, a triple material gage that contained ytterbium, manganin, and constant an foils was tested. This gage provided three independent resistivity history signals as output, one from each material. Results from an analysis of piezoresistance gage response in a multicomponent stress-strain field compared well with the experimental measurements for the triple material gage. 23 refs., 18 figs., 4 tabs.

50180 **New four-channel polarimeter for time-resolved ellipsometry.** Jellison G.E. Jr. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831). *Optics Letters;* **12**: No. 10, 766-768(Oct 1987). Contract AC05-84OR21400.

A new four-channel partial polarimeter was designed for use in time-resolved ellipsometry measurements. The device outputs four parallel, equispaced beams from a single input beam. By detecting and digitizing the intensities of these four beams, the intensity, as well as two of the three elements of the reduced Stokes vector can be determined. Since there are no moving parts to the polarimeter, time resolution is limited only by the response time of the photodetectors and the digitizers. The linear array of output beams is ideal for streak-camera detection, yielding a potential time resolution of ~1 psec. A beam splitter is described that separates the input beam into two beams, which are parallel to the input beam and whose polarizations are nearly the same as the input beam. In addition, the polarimeter is achromatic, operating in the wavelength region from 220 to 1100 nm.

50181 **Multiplex disadvantage and excess low-frequency noise.** Voigtman, E.; Winefordner, J.D. (Chemistry Department, University of Florida, Gainesville, Florida 32611). *Applied Spectroscopy;* **41**: No. 7, 1182-1184(Sep 1987).

Analysis of the performance of a Fourier transform spectrometer with respect to source shot and flicker noises is presented. It was found that source shot noise uniformly distributes throughout the baseline, whereas source flicker noise remains localized about the generating spectral region(s).

50182 **Circular dichroism, linear dichroism, and dual-beam absorption measurements with a commercial spectropolarimeter in the vacuum UV spectral region.** Edmondson, S.P.; Salzman, G.C. (Life Sciences Division, Los Alamos National Laboratory, Mail Stop M888, Los Alamos, New Mexico 87545). *Applied Spectroscopy;* **41**: No. 6, 1075-1078(Aug 1987).

Modifications are described for dual—beam absorption on a commercial spectropolarimeter, the Jasco 40CS, by using the extraordinary ray from the polarizer.The measurement and calibration of linear dichroism on the Jasco 40CS spectropolarimeter are also discussed.(AIP)

4404 Well Logging Instrumentation

REFER ALSO TO CITATION(S) 49499

50183 **Example of nuclear data center services for geophysics applications.** Rose, P.F.; Burrows, T.; Tuli, J. (Brookhaven National Lab., Upton, NY, USA). *Nuclear Geophysics;* **1**: No. 3, 277-282(1987).

A bibliographic survey of the available experimental data on neutron-induced γ-ray production has been made. Use was made of data center on-line search and retrieval capabilities. CINDA was searched for prompt γ-ray production data covering a large incident neutron energy range, and where possible, EXFOR was used to scan the data and select representative works. From the survey it appears that many measurements will have to be supplemented by theoretical calculations.

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 49945, 50177, 50179

50184 **Stress-time profiles in low density HMX.** Dick, J.J. (Los Alamos National Lab., Los Alamos, NM 87545). *Combustion and Flame;* **69**: No. 3, 257-262(Sep 1987).

Stress-time profiles were measured in initiating HMX explosive (cyclotetramethylene tetranitramine) at a density of 1.24 g/cm/sup 3/ (35% voids) using manganin gauges. Initial stress in the explosive was 0.8 GPa. The profiles show development of a reactive peak at the shock. This is different character than that seen in full density explosives. This behavior along with earlier observation of this explosive can be understood in a consistent manner using simple models of shock initiation of detonation.

4502 Nuclear

50185 **(AD-A—182563/7/XAB) Low-level internal-dose screen - CONUS (Continental United States) tests. Nuclear test personnel review. Technical report, 1 February-15 December 1986.** Barrett, M.; Goetz, J.; Klemm, J.; McRaney, W.; Phillips, J. (Science Applications International Corp., McLean, VA (USA)). 22 Dec 1986. 112p. (SAIC—85/1867). NTIS, PC A06/MF A01.

Errata sheet included.

A methodology is developed whereby DoD participants in the atmospheric nuclear tests program are screened to determine whether they received an internal radiation dose commitment less than a selected threshold. The methodology is based on the external gamma dose that the participant received from the source that concurrently provided the radioactive material to be inhaled. Algorithms are developed to relate the internal dose commitment to external dose parameters. The methodology is used to identify those participants by unit project number who received a 50-year bone dose commitment of less than 150 millirem. Most participants in the continental testing received less than this screen threshold.

50186 **(AD-A—182607/2/XAB) Implications of atmospheric test fallout data for nuclear winter. Doctoral thesis.** Baker, G.H. (Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA). School of Engineering). Feb 1987. 190p. (AFIT/DS/ENP—87-1). NTIS, PC A09/MF A01.

Atmospheric-test fallout data were used to determine admissible dust-particle size distributions for nuclear winter studies. The research was originally motivated by extreme differences noted in the magnitude and longevity of dust effects predicted by particle-size distributions routinely used in fallout predictions versus those used for nuclear-winter studies. Three different sets of historical data were analyzed: 1) Stratospheric burden of strontium-90 and tungsten-185, 1954-1967 (97 contributing events); 2) Continental U.S strontium-90 fallout through 1958 (75 contributing events); and 3) Local Fallout from selected Nevada tests (16 events). The contribution of dust to possible long-term climate effects following a nuclear exchange depends strongly on the particle-size distribution. The distribution affects both the atmospheric residence time and optical depth. One-dimensional models of stratospheric/tropospheric fallout removal were developed and used to identify optimum particle distributions. Results indicate that particle distributions which properly predict bulk stratospheric activity transfer tend to be somewhat smaller than number size distributions used in initial nuclear winter studies.

50187 **(UCRL—96144) The development of low level coastal flow fields when solar radiation is blocked by smoke.** Molenkamp, C.R. (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 14p. (CONF-8708132—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014348.

From 19. general assembly International Union of Geodesy and Geophysics; Vancouver, Canada (9 Aug 1987).

Thick layers of smoke, injected into the atmosphere by fires ignited by a nuclear exchange, would block the incident solar radiation and allow continental regions to cool while oceanic areas remain at constant temperature. It has been suggested that the resultant horizontal temperature gradient could initiate precipitation along the coastline that would rapidly scavenge the smoke. This hypothesis is being investigated using an enhanced version of the Colorado State University mesoscale model to simulate the flow field in the vicinity of continental coastlines. The model has been modified to include cloud formation and the effects of these clouds on the transfer of infrared radiation as well as improving the basic long wave radiation parameterization. For moderate westerly winds over the east coast (offshore flow), a layer of fog forms just above the ground that, after about 2 days, evolves into a stratus cloud. Over the ocean a similar stratus cloud forms because of upward mixing of water vapor and radiative cooling. Once these similar cloud layers form, the cooling rates over land and sea become nearly the same eliminating the proposed mechanism for development of convective precipitation and scavenging of mid- or high-level smoke. For the same westerly winds on the west coast (onshore flow), the sequence is similar but evolves more quickly because more moisture is present in the upwind maritime air. In both cases, the formation of ground fog prevents the air temperature in the surface layer from falling below the temperature at which saturation occurs. Before the temperature decreases further, moisture must be removed from the layer.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

REFER ALSO TO CITATION(S) 50404

5001 Basic Studies

REFER ALSO TO CITATION(S) 50216

50188 **(IFUSP-P—567) Pixe method as microanalytical instrument.** Tabacniks, M.H. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Feb 1986. 10p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703416.

The PIXE method (Particle Induced X-Ray Emission) as analytical method presenting the evolution, the theoretical fundaments, the detection limit, the optimization for operational conditions is evaluated. The applications of the method to air pollution control and aerosol studies in regions such as Antartic, Amazon and other regions are analysed. (M.C.K.).

50189 (IFUSP-P—572) Characteristics of fine and coarse particles of natural and urban aerosols of Brazil. Orsini, C.M.Q.; Tabacniks, M.H.; Artaxo Netto, P.E.; Andrade, M.F.; Kerr, A. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Feb 1986. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703420.

Fine and coarse particles have been sampled from 1982 to 1985 in one natural forest seacoast site (Jureia) and five urban-industrial cities (Vitoria, Salvador, Porto Alegre, Sao Paulo, and Belo Horizonte). The time variations of concentrations in air and the relative elemental compositions of fine and coarse particle fractions, sampled by Nuclepore stacked filter units (SFU), have been determined gravimetrically and by PIXE analysis, respectively. Enrichment factors and correlation coefficients of the trace elements measured lead to unambiguous characterization of soil dust and sea salt, both major aerosol sources that emit coarse particles, and soil dust is also a significant source of fine particles.

50190 (RFP—4145) TRAC [terrain-responsive atmospheric code] validation: Alternative study plans. Hodgin, C.R. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). Jun 1987. Contract AC04-76DP03533. 12p. (CONF-8706156—2-Vugraphs). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012085.

From Workshop on evaluation of the TRAC dispersion model; Golden, CO, USA (24 Jun 1987).

Viewgraphs from field tests of the TRAC code are presented from an oral presentation. (PSB)

50191 Wind and temperature structure over a land-water-land area. Doran, J.C.; Gryning, S. (Pacific Northwest Laboratory, Richland, WA 99352). *Journal of Applied Meteorology;* **26**: No. 8, 973-979(Aug 1987). Contract AC06-76RL01830.

Wind and temperature data obtained on 5 June 1984 during the O-dash-barresund experiment are analyzed. The day was characterized by moderately strong winds blowing from a heated land area over a colder water surface and then over a second heated land area. To aid our interpretation of the data, the Colorado State University Hydrodynamic Mesoscale Model was used to simulate conditions on that day. The near-surface winds were found to accelerate over the water near the upwind coast, subsequently decelerated as the water fetch increased, and accelerated once again as the second land surface was encountered. At higher levels, the winds accelerated over the water and decelerated over land. Good agreement was found between observations and the simulation. The more complicated behavior of the lower level wind fields is caused by a combination of roughness length changes and the development of a shallow stable layer over the water that inhibits vertical momentum transfer.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 49259, 49260, 49261, 49262, 49263, 49264, 49265, 49266, 49267, 49283, 49379, 49523, 49808, 50187, 50311

50192 (DOE/ER/60292—3) Operation and research at the Ithaca MAP3S Regional Precipitation Chemistry Site: Annual progress report for 1 December 1986-30 November 1987. Butler, T.J.; Likens, G.E. (New York Botanical Garden, NY (USA). Inst. of Ecosystem Studies). Jul 1987. Contract FG02-85ER60292. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012750.

Data at the MAP3S Site for 1 June 1986 to 31 May 1987 show average conditions in terms of precipitation amount (100 cm/yr), H^+ concentration (63.9 μeq/liter), and H^+ deposition (641 eq/ha-yr). H^+ (lab) and Cl^- show significant (0.05 level) downward trends from 1977 to 1984. Trends for all sites were examined for SO_4/sup =/ (anthropogenic source), and Ca^{++} (crustal source). SO_4/sup =/ generally shows insignificant but downward trends. Ca^{++} shows insignificant trends, both upward and downward. Frequency diagrams of storm sizes show an exponential decay with increasing storm volume at all sites. Composition of dry deposition consists of 15% to 30% anthropogenic particles and calcium species consists of 33% to 50% $CaSO_4$. Conversation of $CaCO_3$ to $CaSO_4$ by absorption of SO_2 occurs at a rate of 0% to 20% per day. 1 ref., 9 figs., 1 tab.

50193 (EML—462) Cross-Appalachian Tracer Experiment (CAPTEX '83) quality assurance of surface samples. Lagomarsino, R.J.; Thomas, F.L.; Weber, T.J.; Greenfield, L.R. (USDOE Environmental Measurements Lab., New York). Feb 1987. 55p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87013828.

Seven separate releases of perfluoromonomethylcyclohexane tracer from either Dayton, Ohio or Sudbury, Ontario determined atmospheric transport and dispersion across the Appalachian Mountains to the northeastern United States and southeastern Canada. Surface samplers were emplaced in an array along the expected tracer plume trajectory. The EML quality assurance procedures for the preparation of the samplers as well as estimates of the precision and accuracy of sampling and gas chromatographic analysis are discussed. 6 refs., 4 figs., 6 tabs.

50194 (EPRI-CS—5196) Particle emission and operating characterization of an electrostatically enhanced fabric filter pilot plant: Final report. Pyle, B.E.; Pontius, D.H.; Martin, C.E. (Southern Research Inst., Birmingham, AL (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 122p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920024.

Southern Research Institute performed an experimental study to investigate the Potential advantages of precharging fly ash before collection in a fabric filter baghouse. The study was performed on a pilot scale, reverse-gas cleaned, fabric filter at the Electric Power Research Institute (EPRI), Arapahoe Test Facility in Denver, Colorado. The system utilized a high intensity ionizer, developed jointly by EPRI and Air Pollution Systems. The ionizer was installed upstream of the baghouse to precharge the fly ash particles. While collection efficiencies were comparable to those of conventional baghouses (>99.9%), the tube sheet pressure drop observed during operation with the charger on was substantially lower than that obtained with the charger off. This was true especially at the higher air-to-cloth (A/C) ratios. Following long-term operations (in excess of 1200 hours) at an A/C value of 3, the average tube sheet pressure drop recorded while using charged ash (Δp = 4 in. H_2O) was found to be approximately 50% less than that using uncharged ash (Δp = 8 in. H_2O). Thus, it appears that a substantial benefit, in terms of reduced baghouse pressure drop, may be obtained by precharging the ash before filtration. As a result of the reduced pressure drop achieved with precharged ash, the baghouse may then be operated at a substantially higher air-to-cloth ratio. The direct result of this would be to reduce the physical size of the baghouse required for a given installation. Thus by requiring a smaller baghouse, substantial savings may be possible in construction costs and operating expenses.

50195 (IVL-B—828) Compilation of results from airborne components monitored at the Swedish EMEP-stations during 1979-1985. Loevblad, G.; Andreasson, K.; Dahlberg, K. (Swedish Environmental Research Inst., Goeteborg). Jun 1986. 32p. (In Swedish). NTIS (US Sales Only), PC A03. File Number DE87753355.

Within the EMEP-network concentrations of SO/sub 2/, NO/sub 2/ soot and particleborne sulphur and concentration in precipitation of SO/sub 4/ /sup 2-/, NO/sub 3/ /sup -/, Cl/sup -/, NH/sub 4/ /sup +/ and H/sup +/ have been measured at five stations. The results from 1978-1985 are compiled in this report. (authors).Within the EMEP-network concentrations of SO/sub 2/, NO/sub 2/ soot and particleborne sulphur and concentration in precipitation of SO/sub 4//sup 2-/, NO/sub 3//sup -/, Cl/sup -/, NH/sub 4//sup +/ and H/sup +/ have been measured at five stations. The results from 1978-1985 are compiled in this report. (authors).

50196 **(ORNL/TM—10478) Sensitivity analysis of the residential energy use module of the Commercial and Residential Energy Use Emissions Simulation System (CRESS).** Trowbridge, L.D. (Oak Ridge National Lab., TN (USA)). Jul 1987. Contract AC05-84OR21400. 63p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000019.

A sensitivity analysis of HOME2, the residential energy use component of Argonne National Laboratory's Commercial and Residential Energy Use and Emissions Simulation (CRESS), has been carried out using an automated analysis tool developed at Oak Ridge National Laboratory. HOME2 projects US residential sector energy use from a number of historical and projected economic and demographic parameters. The energy use projections from HOME2 are used in later modules of CRESS to estimate future emissions for five fossil energy-related atmosphere pollutants. Sensitivities of energy use projections to the various driver and control parameters are presented in this report. Automated sensitivity analysis provides the ability to explore many aspects of model behavior. In the early phases of this study, sensitivity analysis of a predecessor version of HOME2 (June 1986) revealed anomalous behavior in several areas, which led to detection and correction of some difficulties in that version of the residential energy use module of CRESS.

50197 **(PB—87-203535/XAB) Effects of surrounding buildings on wind-pressure distributions and ventilation losses for single-family houses. Part 2. 2-storey terrace houses. Research report.** Wiren, B.G. (National Swedish Inst. for Building Research, Gaevle). Mar 1987. 59p. (TN—2). NTIS, PC PC E04/MF E01.

See also Part 1, PB—86-178134.

In residential buildings with natural, i.e., weather-induced ventilation, the ventilation rate may be higher than needed to ensure safe levels of indoor air quality. In cold and temperate zones the heat loss associated with excessive air infiltration may constitute an important part of the heat load on the building. For the calculation of ventilation losses to be reliable, an accurate knowledge of the wind pressures acting on the building surfaces is required. The aim of this work is: (i) to provide wind-pressure data that are more realistic than those presently available for the calculation of wind-induced ventilation rates and associated heat losses from two-storey terrace houses, as influenced by adjacent, identical houses and (ii) to illustrate, quantitatively, the influence of density and layout pattern of a group of houses on the ventilation loss from each house. The work is part of the research program of the National Swedish Institute for Building Research.

50198 **(PB—87-203766/XAB) Appendix F - quality-assurance procedures. Procedure 1 - quality assurance requirements for gas continuous-emission-monitoring systems used for compliance determination. Summary of comments and responses.** (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Apr 1987. 83p. (EPA—450/3-87/009). NTIS, PC A05/MF A01.

50199 **(PB—87-206207/XAB) Emission rates of carbon monoxide, particulate matter, and benzo(a)pyrene from prescribed burning of fine Southern fuels. Forest Service research note.** White, J.D. (Forest Service, Asheville, NC (USA). Southeastern Forest Experiment Station). Apr 1987. 10p. (FSRN-SE—346). NTIS, PC A02/MF A01.

Emissions of carbon monoxide (CO), particulate matter (PM), and benzo(a)pyrene (BaP) were measured during prescribed burning of four fine fuels of the Southeastern United States by both backing fires and heading fires. Mean emission factors for CO ranged from 57 to 114 g/kg, for PM from 13 to 39 g/kg, and for BaP from 0.22 to 0.76 mg/kg. These values are within the range found by other workers in similar fuels. Emission factors appeared to be influenced somewhat by fuel type and fire type for all three emission products. Emission rates for CO ranged from 0.14 to 1.04 g/m/s, for PM from 0.03 to 0.41 g/m/s, and for BaP from 1.00 to 8.83 g/m/s. These emission rates are meaningful only for the fuel and weather conditions under which they were monitored. Emission rates generally fluctuated more than emission factors.

50200 **(PB—87-208336/XAB) Waste incineration and emission control technologies.** Brna, T.G.; Sedman, C.B. (Environmental Protection Agency, Research Triangle Park, NC (USA). Air and Energy Engineering Research Lab.). Jul 1987. 21p. (EPA—600/D-87/147-S). NTIS, PC A02/MF A01.

Supersedes PB—87-191623.

This paper gives results of a survey of available waste incineration and emission-control technologies in the U.S., Japan, and Western Europe. Increasing concern over landfills as a waste-management option and the decreasing availability of sites have focused attention on incineration for destruction of hazardous wastes and volume reduction of other wastes in the U.S. Incineration requires the control of air-pollutant emissions, which can be minimized by combining in-furnace and post-combustion control technologies. Since future potential regulation of both hazardous air pollutants and acid rain precursors may cause extensive retrofit or early termination of existing waste-incineration installations, planning for new or modified installations should recognize the various control technologies available in order to minimize future outlays if regulations are tightened.

50201 **(PB—87-208872/XAB) Kinetics and mechanisms of the gas-phase reactions of the hydroxyl radical with organic compounds under atmospheric conditions.** Atkinson, R. (California Univ., Riverside (USA). Statewide Air Pollution Research Center). 1985. 134p. NTIS, PC A07/MF A01.

Pub. in Chemical Reviews, Vol. 86, No. 1, 69-201 1986.

The available kinetic, mechanistic, and product data for the gas-phase reactions of the OH radical with organic compounds are discussed and evaluated with an emphasis upon these data under atmospheric conditions. In addition, a-priori predictive techniques for the estimation of room-temperature rate constants for the reaction of OH radicals with organics are reviewed, and a comprehensive a-priori predictive technique is presented.

50202 **(PB—87-210712/XAB) EPA (Environmental Protection Agency) Indoor-Air Quality Implementation Plan.** (Environmental Protection Agency, Washington, DC (USA). Office of Health and Environmental Assessment). Jun 1987. 623p. NTIS, PC PC E99.

Set includes PB—87-210720 through PB—87-210761.

A separate abstract was prepared for each of 5 reports of this act.

50203 **(PB—87-210720/XAB) EPA (Environmental Protection Agency) Indoor-Air Quality Implementation Plan. A report to Congress under Title IV of the Superfund Amendments and Reauthorization Act of 1986: radon gas and indoor air-quality research. Final report.** (Environmental Protection Agency, Washington, DC (USA). Office of Health and Environmental Assessment). Jun 1987. 33p. (EPA—600/8-87/031). NTIS, PC A03/MF A01.

See also PB—87-210738; Also available in set of 5 reports PC E99, PB—87-210712.

The EPA Indoor Air Quality Implementation Plan provides information on the direction of EPA's indoor air program, including the Agency's policy on indoor air and priorities for research and information dissemination over the next two years. EPA submitted the report to Congress on July 2, 1987 as required by the Superfund Amendments and Reauthorization Act of 1986. There are five appendices to the report: Appendix A--Preliminary Indoor Air Pollution Information Assessment; Appendix B--FY 87 Indoor Air Research Program; Appendix C--EPA Radon Program; Appendix D--Indoor Air Resource History (Published with Appendix C); Appendix E--Indoor Air Reference Data Base.

50204 **(PB—87-210738/XAB) EPA (Environmental Protection Agency) Indoor-Air Quality Implementation Plan. Appendix A. Preliminary indoor air pollution information assessment. Final report.** (Environmental Protection Agency, Washington, DC (USA). Office of Health and Environmental Assessment). Jun 1987. 320p. (EPA—600/8-87/014). NTIS, PC A14/MF A01.

See also PB—87-210720, and PB—87-210746; Also available in set of 5 reports PC E99, PB—87-210712.

The Preliminary Indoor Air Pollution Information Assessment summarizes and assesses information from the published scientific literature regarding sources of indoor pollutants, monitoring methodology and instrumentation, exposure, health effects, and mitigation strategies. Information is pollutant-specific, and where possible, source specific. Gaps in scientific information are identified to form the basis of a research needs statement addressing specific research initiatives needed to fill these gaps.

50205 **(PB—87-210746/XAB) EPA (Environmental Protection Agency) Indoor-Air Quality Implementation Plan. Appendix B. FY 87 indoor-air research program. Final report.** (Environmental Protection Agency, Washington, DC (USA). Office of Health and Environmental Assessment). Jun 1987. 65p. (EPA—600/8-87/032). NTIS, PC A04/MF A01.

See also PB—87-210738, and PB—87-210753; Also available in set of 5 reports PC E99, PB—87-210712.

The FY 87 Indoor Air Research Program summarizes the research projects undertaken in FY 87. The projects are categorized under Problem Characterization, Mitigation Assessment and Actions, and Information Dissemination.

50206 **(PB—87-210753/XAB) EPA (Environmental Protection Agency) Indoor-Air Quality Implementation Plan. Appendix C. EPA radon program. Appendix D. Indoor air resource history. Final report.** (Environmental Protection Agency, Washington, DC (USA). Office of Health and Environmental Assessment). Jun 1987. 20p. (EPA—600/8-87/033). NTIS, PC A02/MF A01.

See also PB—87-210746, and PB—87-210761; Also available in set of 5 reports PC E99, PB—87-210712.

The EPA Radon Program briefly describes the goals, strategy and implementation plan adopted by the Agency for dealing specifically with radon as an indoor air pollutant. This discussion is excerpted from a more comprehensive report, EPA Interim Report to Congress on Indoor Air Pollution and Radon. The Indoor Air Resource History is a one page summary of EPA resources (funds and personnel) expended on the indoor air program. The summary begins with FY 84 and extends to FY 88 where projected figures are given.

50207 **(PB—87-212775/XAB) Factors influencing the composition and quantity of passenger-car refueling emissions. Part 2. Final report.** Braddock, J.N. (Environmental Protection Agency, Research Triangle Park, NC (USA). Atmospheric Sciences Research Lab.). Jul 1987. 37p. (EPA—600/D-87/234). NTIS, PC A03/MF A01.

See also Part 1, PB—86-148467.

The study measured and characterized refueling emissions from a 1986 Pontiac Grand Am using 3 test fuels, including a winter, summer, and intermediate-blend gasoline under a variety of seasonal temperature conditions. It investigated three major parameters that affect refueling emissions: fuel volatility, expressed as Reid Vapor Pressure (RVP); dispensed fuel temperature (Td); and tank fuel temperature (Tt). In the study, RVP varied from 10.0 to 13.3 psi, Td varied from 50 to 88 F, and Tt varied from 40 to 108 F, while the overall hydrocarbon (HC) refueling emission rate ranged from 2.90 to 7.41 grams/gallon. Detailed hydrocarbon analyses were completed for both the test fuels (dispensed fuel and tank fuel) and the refueling vapor. The overall mean (from all test fuels and temperature scenarios) HC emission rate was 4.69 g/gal; the mean refueling vapor was comprised of 79.7% paraffins, 13.6% olefins, 5.8% aromatics, with an average carbon number of 4.76; overall mean test gasoline was comprised of 39.5% paraffins, 7.7% olefins 49.0% aromatics, with an average carbon number of 7.30. Butanes and pentanes comprised about 70% of the total HC refueling vapor.

50208 **(PB—87-213534/XAB) Design of a Great Lakes Atmospheric Inputs and Sources (GLAIS) network.** Murphy, T.J. (De Paul Univ., Chicago, IL (USA)). Mar 1987. 45p. NTIS, PC A03/MF A01.

This report includes the design of a network aimed at determining the identity, amounts, and sources of the materials coming into the Great Lakes from the atmosphere. It is meant to discuss what is known and what needs to be known about sampling atmospheric inputs to lakes. It does not strive to be thorough and comprehensive, as this is not possible for such a broad subject.

50209 **(PNL—6292) Application and sensitivity studies of the orographic cloud model MCCP [Mountain Cloud Chemistry Program] PLUVIUS.** Chapman, E.G.; Luecken, D.J.; Whiteman, C.D. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1987. Contract AC06-76RL01830. 59p. NTIS, PC A04/MF A01; GPO Dep. File Number DE87013867.

A special MCCP version of the PLUVIUS MOD 5.0 reactive storm model (MCCP PLUVIUS) was applied to conditions representative of Mt. Mitchell, North Carolina. Tests were also conducted to determine the sensitivity of the model to various meteorological and chemical parameters. Results of the modeling investigation indicate that aqueous concentrations and deposition fluxes of pollutants are location dependent. The greatest concentrations occur at the edges of the cloud, where the liquid water content is low, and the greatest deposition flux occurs on the windward side of the mountain. For conditions considered representative of summertime conditions at Mt. Mitchell, predicted ion concentrations in deposited cloud water at a point corresponding to the MCCP field station are within the ranges actually observed. Sensitivity studies indicate that in-cloud oxidation of SO_2 makes a limited contribution to total sulfate deposition for typical concentrations of SO_2, O_3, and H_2O_2. However, sulfate deposition predicted by MCCP PLUVIUS is extremely sensitive to the value selected for aerosol sulfate existing in the modeled air mass prior to cloud formation. Hydrogen ion deposition predicted by the model is strongly influenced by input values for gas-phase nitric acid and ammonia. 11 refs., 19 figs., 9 tabs.

50210 **(UCRL—96286) Simulation of global wet and dry deposition of nitric acid in a three-dimensional chemistry-transport model.** Walton, J.J.; Wuebbles, D.J.; Hameed, S. (Lawrence Livermore National Lab., CA (USA); State Univ. of New York, Stony Brook (USA). Lab. for Planetary Atmospheres Research). May 1987. Contract W-7405-ENG-48. 12p. (CONF-870977—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87009847.

From International rain conference; Lisbon, Portugal (1 Sep 1987).

Estimated sources of NO/sub x/ in combustion are prescribed in the model as functions of latitude and longitude. The model calculates the conversion of NO/sub x/ to HNO_3, horizontal and vertical transport, and dry and wet deposition of these species. The calculated atmospheric distribution and deposition of NO/sub x/ and HNO_3 are compared with observations and found to be in general agreement. 16 refs., 6 figs.

50211 **Assessment of population health risks resulting from exposures to airborne particles.** Ozkaynak, H.; Spengler, J.D.; Garsd, A.; Thurston, G.D. (Harvard Univ., Cambridge, MA). pp 1067-1080 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, J.P. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—).

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

The main objectives of the EEPC study were: (a) to offer guidance to risk assessors in predicting the health effects of particulates; (b) to identify deficiencies in the data bases used to generate health risk assessments; and (c) to make recommendations for future studies with the purpose of improving the current body of knowledge in the area of particle health effects investigations. Although research has been aimed at reducing existing uncertainties in estimates of health effects through both toxicologic and epidemiologic investigations, special emphasis is placed on epidemiologic assessments utilizing new methods and recent data bases, e.g., the EPA's Inhalable Particle Monitoring Network (IPMN) data sets. In this report, results of the past four years of work and the principal findings from latest assessments regarding the mortality and morbidity effects of particle pollution are summarized.

50212 **A case study of materials damage due to air pollution and acid rain in New Haven, Connecticut.** Lipfert, F.W.; Dupuis, L.R.; Malone, R.G.; Schaedler, J.W.; Daum, M.L. (Environmental Systems Analysis Group, Dept. of Applied Science, Brookhaven National Lab., Upton, NY). pp 983-999 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, J.P. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—). Contract AC02-76CH00016.

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

This case study was prepared as a trial analysis for the National Acid Precipitation Assessment Program's (NAPAP) 1985 Assessment, which seeks to develop baseline data on the extent of damages attributed to acidic deposition. The effects of wet and dry deposition from both gases and aerosols are closely intertwined, and are studied together. Furthermore, the ultimate goal of NAPAP is to define the costs and benefits of control strategies for acidic deposition; benefits accruing directly from the reductions of SO/sub 2/ (gas) in the atmosphere are considered as well as those resulting directly from reductions in wet deposition of corrosive agents. The economics of materials damage due to air pollution are assessed, but usually on a broad basis. Such an assessment requires combining quantities of materials at risk, meteorological conditions, and atmospheric deposition estimates. It is necessary to treat each of these quantities as a broad spatial average or aggregate; covariances are neglected. In most cities, the distributions of air quality and of sensitive materials are non-uniform, as are the climatic factors which promote corrosion. This case study attempts to resolve non-uniformities spatially and to assess damages by integrating rather than by aggregating.

50213 **Differences in wet and dry particle deposition parameters between North America and Europe.** Hicks, B.B. (Atmospheric Turbulence and Diffusion Div., Air Resources Lab., ERL/NOAA, Oak Ridge, TN). pp 973-982 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, J.P. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—).

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

The intent of this study is to demonstrate that local conditions influence deposition formulations; hence, the most appropriate parameterizations for Europe are not necessarily best for North America, and vice versa. There are many other ways in which significant differences exist between deposition mechanisms in North America and Europe. Among the causes of greatest concern are cloud-base altitude, snowfall and the extent of snow cover, agricultural (and silvicultural) practices, maritime influences, topography, and canopy type. Nevertheless, inspection of the tabulation leads to three distinct conclusions: fog interception is likely to be a more important deposition mechanism in Europe than North America; the ratio of dry to wet deposition (excluding fog interception) is likely to be much greater in Europe than North America; and wet deposition parameterizations should favor stratiform systems (best approximated in terms of scavenging rates) for Europe, and unstable systems (scavenging ratios) for North America. The practical ramifications are of considerable importance. First, models developed for one continent should not blindly be applied to another. Second, a successful verification program in one continent should not be interpreted as a justification to apply a model elsewhere. Third, field programs are required to test even well-founded formulations in geographical circumstances different from those on which the formulations are based.

50214 **Effects of inhaled acid aerosols on human lung function: Studies in normal and asthmatic subjects.** Utell, M.J.; Morrow, P.E. (Dept. of Medicine and Dept. of Radiation Biology and Biophysics, Univ. of Rochester School of Medicine and Dentistry, Rochester, NY). pp 671-681 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, P.J. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—).

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

In this chapter, effects of inhalation of sulfuric acid aerosols are given in concentrations ranging from a "worst case" ambient episode (100 μg/m/sup 3/) to the Threshold Limit Value (TLV)/ sup 6/ for occupational exposure (1000 μg/m/sup 3/) for periods of 16 minutes to 4 hours on lung mechanics in normal and asthmatic subjects. To permit comparison and contrast of responses, studies are reviewed in which aerosol pollutants are delivered either by a mouthpiece or using an environmental chamber facility.

50215 **Biological fate of inhaled organic compounds associated with particulate matter.** Bond, J.A.; Sun, J.D.; Mitchell, C.E.; Dutcher, J.S.; Wolff, R.K.; McClellan, R.O. (Inhalation Toxicology Research Institute, Lovelace Biomedical and Environmental Research Institute, Albuquerque, NM). pp 579-592 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, P.J. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—). Contract AC04-76EV01013.

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

In this chapter, toxicokinetic data are presented for benzo[a]pyrene (BaP; a PAH); 1-nitropyrene (NP; a nitro-PAH); 2-aminoanthracene (2-AA; an amino-PAH); and phenanthridone (PNDO; an aza-arene), both in pure forms and associated with carbonaceous (diesel exhaust), organic (coal tar) and inorganic (gallium oxide) particles. The data obtained for the different chemicals are used to predict lung concentrations of the inhaled chemicals in humans. In summary, the results from these series of studies are clearly show that particle association of chemicals does influence the rate of clearance of the particle-associated chemical. The data indicate that under some conditions (e.g., particle association) lungs accumulate significant quantities of inhaled chemicals. In addition, lungs are capable of metabolizing inhaled chemicals to several metabolites. This metabolism occurs via reactive intermediates which potentially bind to the DNA, RNA and protein of lung tissue. Additional studies are currently under way to investigate variables other than particle association of inhaled organic compounds that influence the retention and fate inhaled of chemicals.

50216 **Chemical conversions in clouds.** Schwartz, S.E. (Environmental Chemistry Div., Brookhaven National Lab., Upton, NY). pp 349-375 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, P.J. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—). Contract AC02-76CH00016.

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

The objective of this article is to outline procedures and information necessary to quantitatively evaluate rates and extents of chemical reactions in clouds necessary to assess the importance of specific chemical reactions for representative ambient conditions. This approach to description of these processes requires gaining mechanistic understanding of the components of the overall processes taking place. The assertion that this is the only approach that allows description of situations other than those which are identical or closely similar to those that are studied is offered by the author. The principal role of field measurements is one of providing information necessary to carry out the desired evaluations. Additionally, however, field measurements provide indications of the occurrence (or lack thereof) of particular processes, and are therefore valuable from this perspective as well. However, the goal of research in cloud chemistry (as in atmospheric chemistry generally) is acquiring mechanistic understanding, not simply obtaining a set of empirical "field determined" rates.

50217 Sulfuric acid and sulfate aerosol events in two U.S. cities. Spengler, J.D.; Allen, G.A.; Foster, S.; Severance, P.; Ferris, B. Jr. (Environmental Science and Physiology, Harvard School of Public Health, Boston, MA). pp 107-120 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, P.J. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—).

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

There is a growing evidence that atmospheric aerosols in the lower troposphere is acidic at times. Sulfur gases are believed to be the dominant precursors of acidic particles in the atmosphere. Nitrous, hydrochloric, and organic gases also lead to acidic particles by absorption or condensation. Unfortunately, due to the lack of extensive or systematic measurements, the temporal variation and the geographic extent of sulfur-related acid aerosol events are not well-documented. This chapter focusses on a comparison of the sulfuric acid and sulfate events occurring in these two communities. The summary statistics are based on continuous sulfate data available from all of 1984. After a review of the sulfate data, select time periods are identified for more in-depth analysis. The aerometric data for these periods is quality-assured in order to examine the correlations among parameters and to closely examine a few case studies.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 49373, 49380, 49381, 49386, 49391, 49392, 49417, 49422, 49447, 50203, 50247

50218 (CCRX—84) Measurements of radioactive and xenobiotic substances in the biosphere in The Netherlands 1984. (Coordinatie-Commissie voor de Metingen van Radioactiviteit en Xenobiotische Stoffen (CCRX), Rijswijk (Netherlands); Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, The Hague (Netherlands)). 1985. 50p. (In Dutch). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703377.

In this annual report the results and conclusions are given of radioactive and xenobiotic substances in the biosphere of the Netherlands. The measurements are coordinated by the Coordination Committee for the Monitoring of Radioactive and Xenobiotic substances. (Auth.). 26 figs.; 30 tabs.

50219 (CCRX—85) Measurements of radioactive and xenobiotic substances in the biosphere in The Netherlands 1985. (Coordinatie-Commissie voor de Metingen van Radioactiviteit en Xenobiotische Stoffen (CCRX), Rijswijk (Netherlands); Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, The Hague (Netherlands)). 1986. 57p. (In Dutch). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703378.

In this annual report the results and conclusions are given of radioactive and xenobiotic substances in the biosphere of the Netherlands. The measurements are coordinated by the Coordination Committee for the Monitoring of Radioactive and Xenobiotic substances. (Auth.). 26 figs.; 32 tabs.

50220 (CTA-IEAV-NT—05/87) Aerial monitoring in the caldasite chrorination pilot plant. Goncalez, O.L. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). 24 Mar 1987. 18p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703403.

The results of air monitoration in the chlorination facility of the PMR/IPD/CTA are presented. The total dust and alpha activity concentration in the air were measured in two representative work places. Two common type of anti-dust masks were evaluated. The samples were taken by air aspiration by a plane membrane filter. It was found that both total dust and alpha activity concentrations are lower than the maximum permissible levels.

50221 (INIS-mf—10992) Participation report of the seminar on the environmental transfer to man of radio-nuclides released from nuclear installations. Keen, A. (Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, Wageningen (Netherlands)). Oct 1983. 50p. (In English and Dutch). (CONF-831032—). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703577.

From Seminar on the environmental transfer to man of radionuclides released from nuclear installations; Brussels, Belgium (17 Oct 1983).

This report contains a list of participants and of designating member states and organizations together with the subject titles of their contributions. (Auth.).

50222 (NEI-DK—33) Final report on Risoe measuring program in connection with Chernobyl accident. Aarkrog, A. (Risoe National Lab., Roskilde (Denmark)). Jan 1987. 50p. (In Danish and English). NTIS (US Sales Only), PC A03/MF A01. File Number DE87752877.

The present report deals with the measurements of Chernobyl debris carried out in Denmark, the Faroe Islands and Greenland in the perioed May-September 1986. The results are presented in details in appendix II, but summarized in tables and figures in the main report, which is in Danish. Appendix I is the samples programme, also in Danish. It is concluded that the dose equivalent commitment to an adult Dane from consumption of foodstuffs in the first year after the accident (May 1986-April 1987) is 17 μ Sv, corresponding to approximately 1% of a years background radiation.

50223 (ORNL/M—388) Environmental surveillance data report for the second quarter of 1987. (Oak Ridge National Lab., TN (USA)). Sep 1987. Contract AC05-84OR21400. 114p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87014932.

During the second quarter of 1987, tritium concentrations in White Oak Creek and Melton Branch were several times higher than normal. An apparent release of tritium occurred during the second week of May, and continued through the first part of June. The source of the tritium has not been identified. At the Paint Facility, there were three noncompliances of total suspended solids for the quarter. It appears that these violations are not due to the Paint Facility, but may be due to area runoff. A pH monitoring instrument at the coal yard may be responsible for two permit violations at that facility. Twenty-one wells were sampled around 3524, 3539, 3540, and the 7900 ponds during the quarter. Most of the wells exceeded the EPA's Interim Primary Drinking Water Standard for gross beta, as they have in the past. Six other parameter concentrations exceeded the standards for gross alpha, radium, chromium, and nitrate. Five of these were in wells around the 7900 area. Total radioactive strontium ($^{89}Sr + {}^{90}Sr$) in composite fish samples from Clinch River kilometers 40.0 and 8.0 were significantly higher than the last quarter of 1986.

50224 (PB—87-189031/XAB) Superfund Record of Decision (EPA Region 3): Lansdowne Radiation Site, Lansdowne, Pennsylvania (second remedial action), September 1986. Final report. (Environmental Protection Agency, Washington, DC (USA)). 22 Sep 1986. 21p. (EPA/ROD/R—03-86/027). NTIS, PC A02/MF A01.

See also PB—85-249498.

The Lansdowne Radiation site consists of two attached residences located at 105/107 East Stratford Avenue, Lansdowne, PA. The building is located in a residential area, approximately two miles from Philadelphia. The dwellings were contaminated with radium and other radionuclides between 1924 and 1944 as a result of refining radium and producing medical devices. A decontamination effort in 1964 consisted of removing as much radium as practical by sending, scraping, vacuuming, and washing the house walls, floors and ceilings. Some concrete floor and wooden floor boards were also removed. It is postulated that the acid fumes from the radium purification procedure used, as well as spills, carried the radium contamination deep into the wood and plaster of the home. The remedial action includes dismantling of the house. All radioactive materials above established permissible levels will be packed

and sealed in approved containers, and disposed of at an approved offsite disposal facility; contaminated soil located in and around the house will be excavated and removed to established permissible levels. The sewer lateral leading from the contaminated house to Stratford Avenue will be removed and replaced. The capital cost has been estimated at $4,000,000-$4,500,000.

50225 **(VROM-DSB—86-20) Measurements of parameters for determining the radon load in the framework of the Dutch national research program SAWORA.** Groen, G.C.H.; Groot, T.J.H. de; Nyqvist, R.G.; Keverling Buisman, A.S.; Stoute, J.R.D. (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, The Hague (Netherlands). Directie Stralenbescherming). Jun 1986. 88p. (In Dutch). (VROM—60519/6-86). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703669.

This report describes a series of measurements related to the indoor exposure to daughters of radon and thoron. Important parameters are the Potential Alpha Energy Concentration (PAEC) and the Activity Median Aerodynamic Diameter (AMAD). The results for indoor atmosphere are presented leading to an order of magnitude estimate of the effective dose-equivalent rate of 500 μSv/y. The thoron daughter concentrations are relatively high with respect to those of radon daughters. (Auth.). 18 refs.; 24 figs.; 12 tabs.

5006 Regulations

REFER ALSO TO CITATION(S) 49814, 50074, 50224

50226 **(PB—87-200259/XAB) Review of the national ambient air-quality standards for sulfur oxides: updated assessment of scientific and technical information addendum to the 1982 OAQPS (Office of Air Quality Planning and Standards) staff paper. Final report.** (Environmental Protection Agency, Research Triangle Park, NC (USA). Strategies and Air Standards Div.). Dec 1986. 91p. (EPA—450/5-86/13). NTIS, PC A05/MF A01.

See also report dated Nov 82, PB—84-102920.

This paper evaluates and interprets the updated scientific and technical information that EPA staff believes is most relevant to the review of primary (health) national ambient air-quality standards for sulfur oxides and represents an update of previous staff conclusions and recommendations in the 1982 sulfur oxides staff paper to incorporate more recent information. The assessment is intended to bridge the gap between the scientific review in the EPA criteria document second addendum for particulate matter and sulfur oxides and the judgments required of the Administrator in setting ambient air-quality standards for sulfur oxides. The major recommendations of the staff paper addendum include the following: (1) that the health data support the need for sulfur dioxide (SO_2) standards; (2) that new data from controlled human exposure studies on asthmatics and atopics warrant consideration of a new short-term (1-hour) standard; (3) that the current primary and secondary standards (annual, 24-hour, and 3-hour) provide substantial protection against effects associated with 24-hour and annual exposures, and some limit on peak exposures of concern for asthmatics; and (4) that the relative protection afforded by current vs. alternative standards is an important consideration in determining what, if any, standards revisions may be necessary.

50227 **(PNL-SA—14953) Potential economic impacts of air pollution on stumpage and primary wood product markets in the United States.** Callaway, J.M.; Darwin, R.F.; Nesse, R.J. (Pacific Northwest Lab., Richland, WA (USA)). May 1987. Contract AC06-76RL01830. 20p. (CONF-870695—7). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012167.

From 80. annual meeting of the Air Pollution Control Association; New York, NY, USA (1 Jun 1987).

This paper describes the methodological framework that was developed for the National Acid Precipitation Program (NAPAP) to assess the economic impacts of air pollution-induced reductions in forest growth in the eastern United States and to present the results of that analysis. The first section provides background information about NAPAP and presents evidence for concern about possible slowdowns in forest growth in the eastern United States. It shows how standard willingness-to-pay principles can be used to place monetary values on the damages caused by air pollution. Section 2 describes the methodological framework and simulations that were developed to assess the economic impacts of simulated reductions in forest growth, while Section 3 presents the results of these simulations. Section 4 summarizes the findings of this study. 16 refs., 2 figs., 4 tabs.

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

REFER ALSO TO CITATION(S) 49370, 49427

5101 Basic Studies

REFER ALSO TO CITATION(S) 49421, 50130

50228 **(DOE/ER/60529—1) Constraints of bioenergetics on the ecology and distribution of vertebrate ectotherms: Progress report for period 1 January 1987 to 31 December 1987.** Spotila, J.R.; Standora, E.A. (State Univ. of New York, Buffalo (USA). Dept. of Biology). Sep 1987. Contract FG02-87ER60529. 40p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014822.

We quantified the constraints of bioenergetics on the ecology and distribution of vertebrate ectotherms. We completed studies on the thermoregulation of largemouth bass, on the bioenergetics of the slider turtle, Trachemys scripta, and on the role of temperature dependent sex determination in the extinction of dinosaurs. We also began research to develop the three dimensional bioenergetic climate space for freshwater turtles, to determine the role of incubation temperature on the post hatching growth rate of the snapping turtle, Chelydra serpentina, to establish the rate of energy expenditure of the slider turtle, Trachemys scripta, in the field, to determine the field metabolic rates, body temperatures and water flux rates of the box turtle, Terrapene carolina, and to measure the effect of diet type on the consumption rate, digestion rate and digestive efficiency of adult T. scripta. 60 refs., 9 figs.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 49288, 49291, 49379, 50223

50229 **(PB—87-212353/XAB) Availability of cadmium to rats from crops grown on cadmium-enriched soil.** Buhler, D.R.; Tinsley, I.J. (Oregon State Univ., Corvallis (USA)). Jul 1987. 126p. NTIS, PC A07/MF A01.

The research was initiated to enhance understanding of the availability to animals of Cd present in edible plants. Such information is of considerable importance since agricultural crops can accumulate high concentrations of the metal when grown in certain soils or with sewage sludge as a fertilizer. Edible plants were labeled with ^{109}Cd by growing them on $^{109}CdCl^2$ treated soil. The availability of ^{109}Cd to male and female rats was then determined by feeding semisynthetic diets containing either freeze-dried radioactive spinach, lettuce, soybean, carrots, tomatoes, or wheat flour, or comparable nonradioactive plant powders spiked with $^{109}CdCl^2$. Retention of ^{109}Cd by liver and kidney was determined after a 14-day feeding period. With the exception of spinach, Cd accumulation by rats was not found to be significantly influenced by the form of Cd in the diet whether supplied as plant-bound ^{109}Cd or added to nonradioactive diets as $^{109}CdCl^2$. The mean retention of Cd in liver and kidney was 0.17% of the dose consumed for males and 0.26% for females consuming diets containing wheat, soybean, carrots, lettuce, or tomatoes.

50230 **(PB—87-212668/XAB) Characterization of treatment residues from hazardous-waste treatment, storage, and disposal facilities.** Kaplan, B.D. (Metcalf and Eddy, Inc., Wakefield, MA (USA)). Jul 1987. 22p. NTIS, PC A02/MF A01.

To implement the Congressionally mandated land-disposal prohibitions of the 1984 amendments to the Resource Conservation and Recovery Act (RCRA), EPA must determine whether adequate treatment technologies exist, what wastes can be treated and how effectively, what residues and environmental discharges are produced, and what the associated costs are. As part of the program to develop this information, characterization of treatment residues from technologies treating or destroying wastes that have been listed for priority action were determined. The primary focus of the study was to characterize residues resulting from treatment of solvent (F001-F005) wastes and metal-bearing (inorganic compounds on the California list) hazardous wastes. A diversity of waste types, process configuration, and operating procedures were examined. Data are presented on waste and treatment residue characteristics, including data from a second-generation leaching procedure, the Toxicity Characteristic Leaching Procedure (TCLP) and its predecessor, the EP Toxicity Characteristic.

50231 **(PB—87-214342/XAB) Study of biological processes on the US South Atlantic slope and rise. Phase 2. Volume 1. Executive summary. Report for November 1985-March 1987.** Blake, J.A.; Hecker, B.; Grassle, J.F.; Brown, B.; Wade, M. (Battelle New England Marine Research Lab., Duxbury, MA (USA)). 30 Mar 1987. 68p. NTIS, PC A04/MF A01.

See also PB—86-125531 and PB—87-214359.

A total of 16 stations were sampled during a 2-year field program designed to characterize the biological, chemical, and sedimentary processes on the slope and rise off North and South Carolina. Box cores were taken along 4 transects at depths of 600-3500 m. The infauna yielded a total of 1202 species, 520 of which were new to science. Annelids were the dominant taxa in terms of density and numbers of species. Species diversity was highest at an 800 m site off Charleston. Higher than normal lead and hydrocarbon inventories suggest enhanced scavenging processes in the area.

50232 **(PB—87-214359/XAB) Study of biological processes on the US South Atlantic slope and rise. Phase 2. Volume 2. Final report. Report for November 1985-March 1987.** Blake, J.A.; Hecker, B.; Grassle, J.F.; Brown, B.; Wade, M. (Battelle New England Marine Research Lab., Duxbury, MA (USA)). 30 Mar 1987. 557p. NTIS, PC A24/MF A01.

See also PB—86-125549 and PB—87-214342.

A total of 16 stations were sampled during a 2-year field program designed to characterize the biological, chemical, and sedimentary processes on the slope and rise off North and South Carolina. Box cores were taken along 4 transects at depths of 600-3500 m. The infauna yielded a total of 1202 species, 520 of which were new to science. Annelids were the dominant taxa in terms of density and numbers of species. Species diversity was highest at an 800 m site off Charleston. Infaunal densities were highest on the upper slope (600 m) and lowest on the rise (3000 m). Data generated in the infaunal and epifaunal surveys supported the view that a partial zoogeographic barrier exists on the slope off North Carolina.

50233 **Comparison of the effects of wet and dry deposition on crops in the United States.** Irving, P.M. (Environmental Research Div., Argonne National Lab., Argonne, IL). pp 889-900 of Aerosols: Research, risk assessment and control strategies. Lee, S.D.; Schneider, T.; Grant, L.D.; Verkerk, J.P. Chelsea, MI; Lewis Publishers (1986). (CONF-8505106—).

From 2. US-Dutch international symposium on aerosols: research, risk assessment and control strategies; Williamsburg, VA, USA (19 May 1985).

The price of food is a sensitive political issue in every country, and as energy costs increase, profit margins erode and the global food deficit expands, the social and political implications of crop losses become considerably more important. The effects of air pollutants on crop productivity have received the attention of national and international audiences for decades. The following review of the processes and effects of wet and dry deposition provides an understanding of the relative magnitude and extent of potential damage to crops from each of the most prevalent air pollutants. In this analysis, wet deposition refers to acidic rain, or more specifically, the sulfuric and nitric acids present in rain, dew or fog. Dry deposition consists of particulate or gaseous pollutants such as ozone, sulfur dioxide and nitrogen dioxide. The author suggests that humankind has become responsible for shaping the evolution of many other organisms (including crop plants) which are adapting to a modified environment.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 49364, 49365, 49368, 49369, 49371, 49372, 49373, 49376, 49377, 49378, 49380, 49381, 49382, 49385, 49387, 49388, 49389, 49390, 49391, 49392, 49394, 49403, 49404, 49405, 49406, 49416, 49417, 49420, 49422, 49423, 49424, 49425, 49428, 49429, 49431, 49432, 49433, 49434, 49436, 49437, 49451, 50168, 50218, 50219, 50221, 50223, 50247, 50308

50234 **(EIR—622) Modelling small scale infiltration experiments into bore cores of crystalline rock and breakthrough curves.** Hadermann, J.; Jakob, A. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). Apr 1987. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703405.

Uranium infiltration experiments for small samples of crystalline rock have been used to model radionuclide transport. The theory, taking into account advection and dispersion in water conducting zones, matrix diffusion out of these, and sorption, contains four independent parameters. It turns out, that the physical variables extracted from those of the best-fit parameters are consistent with values from literature and independent measurements. Moreover, the model results seem to differentiate between various geometries for the water conducting zones. Alpha-autoradiographies corroborate this result. A sensitivity analysis allows for a judgement on parameter dependences. Finally some proposals for further experiments are made.

50235 (INIS-mf—10992, pp 17) **Statistical analysis of soil-to-plant transfer factors.** Keen, A.; Frissel, M.J. (Inst. TNO voor Wiskunde, Informatieverwerking en Statistiek, Wageningen, Netherlands; Rijksinstituut voor de Volksgezondheid, Bilthoven, Netherlands). Oct 1983. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703577. (CONF-831032—).

From Seminar on the environmental transfer to man of radionuclides released from nuclear installations; Brussels, Belgium (17 Oct 1983).

The working group 'Soil-to-Plant Transfer Factors' of the International Union of Radioecologists prepared recommendations for reliable uptake experiments and collected some 1400 'reliable' transfer factors (TF values). These data were analysed statistically. Some results are based on an additive model for the simultaneous effect of several factors. A difference of 1 pH unit may lead to a difference of the TF value of a factor 5. The availability of /sup 137/Cs in soil decreases in time. For /sup 90/Sr such a decrease could not yet be determined. The experimental design, i.e. pot experiments, lysimeter experiments or field experiments may cause differences of an order of magnitude. Between soils TF values differ a factor 4. Organic matter content and labelling depth cause differences of a factor 2. (Auth.). 19 refs.; 3 figs.; 3 tabs.

50236 **(NAGRA-NTB—83-06) Method for modelling the transport of nuclides in fissured rock with diffusion into the solid matrix.** Hopkirk, R.J.; Gilby, D.J. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1984. 48p. Nagra, CH-5401 Baden, Switzerland.

A technique is described, whereby diffusion of a chain of radionuclides in the microfissures or pores of the matrix material adjacent to water-bearing fractures may be calculated. The method enables the process to be calculated on all scales: in the individual blocks penetrated by a single fracture; in an assembly of characteristic block sizes in a representative volume in a model on a coarser scale. The technique involves an analytical solution to the diffusion-decay-sorption equation in a block of simplified geometry. This is embedded into a numerical (finite difference) computer code which also handles the other mechanisms relevant to the transport of radionuclides in the geosphere. The resulting program is verified against purely analytical solutions for matrix diffusion coupled with convective/dispersive transport of a single nuclide by means of

benchmark calculations. Finally, the effect of matrix diffusion within blocks of varying sizes is demonstrated.

50237 **(NAGRA-NTB—83-10) INTRACOIN level 1 benchmark calculations with EIR codes CONZRA, RANCH and RANCHN.** Hadermann, J.; Roesel, F. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Jul 1983. 57p. Nagra, CH-5401 Baden, Switzerland.

We present the results from calculations of INTRACOIN level 1, case 1 and 2 (one-dimensional advection-dispersion) benchmarks. The codes used are CONZRA and RANCH, corresponding to a semi-analytical solution of the transport equation, and RANCHN based on a fully numerical solution in the framework of the pseudo-spectral method. The influence of various boundary conditions is investigated. Excellent agreement between results from the different solution approaches is obtained.

50238 **(NAGRA-NTB—83-13) Integral approach to radionuclide transport modelling in fissured and porous media.** Gilby, D.J.; Hopkirk, R.J. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1983. 41p. Nagra, CH-5401 Baden, Switzerland.

In order to fulfill the present and future requirements for the prediction of radionuclide migration in the geosphere a suite of numerical computer programs has been developed. They enable the transport of dissolved chemicals in general, of chains of radionuclides in particular and of heat to be calculated in either porous or fissured media. The development of the conceptual models of the flow through porous continua and discrete fissures is related. This is followed by descriptions of the mechanisms affecting movement of the radionuclides and an overview of the resulting computer codes.

50239 **(NEI-DK—34) Radon on Mors Island. An investigation of virtual relationship between radon concentration in indoor air and the local geology in a selected area on Mors.** Damkjaer, A.; Korsbech, U. (Danmarks Tekniske Hoejskole, Lyngby. Afdelingen for Elektrofysik). Mar 1987. 55p. (In Danish). NTIS (US Sales Only), PC A04/MF A01. File Number DE87752879.

The indoor /sup 222/Rn-concentration has been measured in 50 dwellings in a rural district on the Danish island Mors. In addition the radon-exhalation from the ground was measured in close vicinity of the houses. Also, samples of the surface soil has been analyzed for the radium and thorium content and for radon/emanation. The aim of the work has been to search for a possible correlation between the local geology and the indoor radon-concentration. Specifically a correlation was expected between the local deposits of a radium-rich paleocene clay and the indoor radon-concentration. As a result, no correlation has been found neither between the deposits of the radium-rich clay and the indoor radon-concentration, nor between any pair of the measured parameters. However, the southern part of the district shows a significant higher indoor radon-concentration compared to the northern part. This correlates with the limestone deposits which in the southern part of the district come close to the surface. Hence an indication has been found that the limestone deposits act as a transport channel for radon or as a source for enchanced radon-levels in the dwellings.

50240 **(VROM-DSB—86-21) Radiation dose resulting from the releases of fly ash in the environment.** Koester, H.W.; Leenhouts, H.P.; Frissel, M.J. (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, The Hague (Netherlands). Directie Stralenbescherming). Jun 1986. 102p. (In Dutch). (VROM—60250/6-86). NTIS (US Sales Only), PC A06/MF A01. File Number DE87703670.

The radiological consequences from radioactivity in the emissions of coal fired power stations are evaluated for the Dutch population until the year 2030. The energy scenario for the Netherlands with the highest coal input considers an input of 55 Tg coal per year in 2030. The fly ash production is then 5.3 Tg, while 0.03 Tg fly ash will be released into the atmosphere. The radiation doses which result from the radionuclides present in the fly ash were calculated. Several pathways were considered, contribution of most of them were insignificant. However, the inhalation of fly ash may cause and H/sub eff/ of 4.0 E-7 Sv.a/sup -1/. The contribution caused by the ingestion of milk contaminated via depositions of fly ash on grass and soil may reach 0.8 E-7 Sv.a/sup -1/. The report contains numerous calculations, references and a parameter analysis. (Auth.). 123 refs.; 2 figs.; 34 tabs.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 49257, 49258, 49366, 49809

50241 **(EPRI-CS—5426) Liner-waste compatibility studies for coal-fired power plants: Imterim report.** Haxo, H.E. Jr.; Haxo, P.D.; Nelson, N.A.; White, R.M.; Dakessian, S. (Matrecon, Inc., Alameda, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1987. 295p. Research Repts. Ctr., Box 50490, Palo Alto, CA 94303. File Number TI88920022.

This is an interim report on a project whose primary purpose is to measure the long-term effects of liquid wastes from coal-fired power plants on liner materials for waste impoundments. The state of the art of liners and their current use by the coal-fired electric power industry were assessed on the basis of four surveys: (1) a literature review on wastes from coal-fired power plants; (2) a literature review on the use of liners in waste impoundments at such plants; (3) a mail survey of liner technology as available from manufacturers and other parts of the liner industry; and (4) a mail survey of the experience of coal-fired power plants with liners. The last survey was followed by visits to selected plant sites to gather information on the character of wastes and on waste management practices. An extended experimental program was planned and initiated to measure the effects of coal-fired electric power plant wastes on liner materials, under conditions that simulate some aspects of field service. Soil liners, admixes, and synthetic membranes are being tested. They include three clay soils, three admixes, and eight polymeric membranes which are being exposed to eight types of liquid wastes: slurries from three fly ashes with different pH values, two FGD sludges, and air-preheater cleaning waste, a boiler-cleaning waste, and a water treatment brine. The selection of both wastes and liner materials are described. Each material is characterized, preliminary data are presented from screening tests, and limited data are presented on the compatibility of liners with wastes.

5106 Regulations

REFER ALSO TO CITATION(S) 49288, 49373, 50230, 50255

50242 **(PB—87-188488/XAB) Superfund Record of Decision (EPA Region 2): Combe Fill North landfill, Mount Olive Township, New Jersey, September 1986. Final report.** (Environmental Protection Agency, Washington, DC (USA)). 29 Sep 1986. 79p. (EPA/ROD/R—02-86/028). NTIS, PC A05/MF A01.

The Combe Fill North site is located in Mount Olive Township, NJ, near the intersection of U.S. Highway 206 and Interstate 80. The area surrounding the site is primarily wooded, with small residential areas, farms, and light industry nearby. Approximately 10,000 people rely on ground water supplied from wells downgradient of the site. The site operated as a sanitary municipal landfill, accepting municipal, vegetative, and non-chemical industrial wastes, along with small amounts of dry sewage sludge. In 1979, public outrage at the disposal practices led to formation of a public action group which conducted ground water sampling. Ground water, soils, leachate, sediments and surface water were sampled. Low levels of volatile organics were found in soils and leachate, and hexachlorobenzene, phenol and bis (2-ethylhexyl) phthalate were detected in low concentrations in ground water samples. The remedial action for the Combe Fill North site includes grading and compacting the 65-acre waste-disposal area, capping the landfill, installation of a drainage system, installation of a methane ventilation system, fencing the entire site, and implementation of an appropriate monitoring program. Estimated capital cost for the remedy is $10,500,000 with annual O&M costs of $168,000.

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 49421, 50228

50243 (NP—7901001) The ecology of open-bay bottoms of Texas: A community profile. Armstrong, N.E. (Texas Univ., Austin (USA). Dept. of Civil Engineering). May 1987. 119p. US Fish and Wildlife Service, 1010 Gause Blvd., Slidell, LA 70458. File Number TI87901001.

Open-bay bottoms represent one of the most extensive habitats in any estuarine system, especially in the northwestern Gulf of Mexico estuaries of Texas. Seven major estuarine systems are found here (Sabine Lake, Galveston Bay, Matagorda Bay, San Antonio Bay, Copano-Aransas Bays, Corpus Christi Bay, and the Laguna Madre), along with three minor riverine estuaries (Brazos, San Bernard, and Rio Grande) which long ago filled. These bays are typically broad and shallow with average depths of 1.2 to 2.4 m and a total surface area of 624,000 ha. Salt marshes and seagrass beds are small. The structure and function of the benthic communities in these Texas estuaries are examined by reviewing and integrating data from a number of past and ongoing studies. While studies in these systems have not been as numerous as in other estuaries, the patterns of structure and function are beginning to emerge. The key functions of the benthic system are production of biomass as food resources for higher trophic levels; bioturbation, which enhances nutrient regeneration; and nutrient regeneration itself. Benthic nutrient regeneration in the shallow waters of Texas estuaries may play a key role in regulating primary production in the estuaries. Managers of these estuaries must consider the open-bay bottom systems as a critical part of the overall function of these estuaries.

50244 (PB—87-209573/XAB) Annual report of the Marine Mammal Commission, Calendar Year 1984. Report to Congress. (Marine Mammal Commission, Washington, DC (USA)). 31 Jan 1985. 178p. NTIS, PC A09/MF A01.

See also report for 1986, PB—87-154092.

Contents include: reauthorization and amendment of the Marine Mammal Protection Act; research and studies program; international aspects of marine mammal protection and conservation; marine mammal/fishery interactions; incidental take of marine mammals in the course of commercial fishing operations; species of special concern; marine mammal management in Alaska; Outer Continental Shelf oil, gas, and hard minerals development; marine mammal maintenance standards and regulations; permit process.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 49288, 49729, 49791, 49808, 50208, 50223, 50313

50245 (DPSP—87-1115-Rev.) Biological and chemical assessment of M-Area process discharge to Tim's Branch: June 1985-December 1986. Specht, W.L.; Pickett, J.B.; Muska, C.F.; Starkel, W.M.; Giffin, M.; Trapp, K.E. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). May 1987. Contract AC09-76SR00001. 228p. NTIS, PC A11. File Number DE87014438.

This study addresses the effects of the A-014 outfall on the chemistry and biota of Tim's Branch and Upper Three Runs Creek from June 1985 through December 1986. In addition to analyses for chemical parameters, the periphyton and macroinvertebrate communities on each site were sampled to assess the impact of the M-Area discharges on the overall condition of these communities. Acute laboratory toxicity tests were conducted on noncontact cooling water/air stripper water and noncontact cooling water/air stripper water/Liquid Effluent Treatment Facility (LETF) effluent using bluegill sunfish and Daphnia pulex. The data indicate no adverse impact on the water chemistry, water quality, or aquatic communities of the Tim's Branch/Upper Three Runs system due to discharges from the A-014 outfall after startup of the M-Area Project Air Stripper and the M-Area Liquid Effluent Treatment Facility.

50246 (PB—87-210357/XAB) Lead in drinking water: a study on chemical aspects of the plumbosolvency of drinking water in view of the health risks and in relation to central water softening. Doctoral thesis. Haring, B.J.A. (Amsterdam Univ. (Netherlands)). 1984. 165p. NTIS, PC PC E07/MF E01.

See also PB—84-201789.

The study of lead in drinking water described in this thesis includes in fact the formulation of the answers to three main questions: (1) How large is the daily exposure to lead by drinking water in The Netherlands and which factors are of major importance in this respect. (2) How large is the contribution of lead uptake by drinking water in relation to the total lead uptake and in relation to lead in blood. (3) To what extent can water conditioning be effective to reduce lead exposure.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 49365, 49369, 49373, 49385, 49389, 49392, 49393, 49403, 49417, 49419, 49420, 49422, 49424, 49426, 49434, 50209, 50218, 50219, 50221, 50223

50247 (EGG-WT—7774) Environmental protection at the Idaho National Engineering Laboratory. (EG and G Idaho, Inc., Idaho Falls (USA)). Jul 1987. Contract AC07-76ID01570. 26p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014986.

The primary objective of radioactive waste management at the INEL is to minimize the generation of waste products and to ensure that these waste products do not constitute a hazard to life forms. All radioactive waste streams are monitored by highly sensitive instruments and are carefully controlled so that corrective action can be taken, if necessary. In addition, the environment itself is monitored to ensure that controls at the various facilities have been adequate to prevent significant releases of radioactivity. Samples of air, soil, water, and foodstuffs from the vicinity of the INEL are routinely monitored. These surveillance activities verify that the doses to people at or near the INEL from radioisotoptes are extremely small, and far below acceptable limits specified by state and federal regulations.

50248 (INIS-BR—680) Study of the carbon and oxygen isotopic compositions in marine shells of Salvador-Bahia, Brazil. Freitas, J.C.B. de. (Bahia Univ., Salvador (Brazil)). 1977. 56p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87703440.

The carbon and oxygen isotopic composition of 68 samples of marine shells from the region of Salvador was determined. These samples are from points on the open coast and in the interior of the Todos os Santos Bay and they are composed in part by recent specimens and in part by old specimens taken from Quaternary sediments. The results for δ /sup 18/O are in the range of -2,83per mille to + 1,21per mille (PDB) and for δ /sup 13/C in the range of -3,10per mille to +2,63per mille (PDB). The reults for the recent shells from the interior of the Todos os Santos Bay show variations in the δ /sup 13/C values associated to the dominance of organic matter in some regions. For the old samples, gathered in te variations in the δ /sup 13/C values was associated to the existence in points of that region of deposits of fluvio-lagunar sediments, originated during the last marine transgression. It was identified, for a few species with the same age and location, the effect of biological fractionations. Nevertheless, the observed dominant factor on the isotopic differentiation was the environmental fractionation.

50249 (INIS-BR—688, pp 149) Analysis of trace-elements of some radionuclides with short half-life in the suspension particulate material in the Funil dam-Rezende-RJ. . Campos, Marcia M.; Carvalho, J.L.S.; Vasconcellos, M.B.A. (Instituto de Radioprotecao e Dosimetria, Rio de Janeiro, Brazil; Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50250 **(NAGRA-NTB—83-04) Significance of isotopic methods in the hydrogeologic characterization of potential final repository sites for high-level radioactive wastes.** Balderer, W. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Dec 1983. 181p. (In German). Nagra, CH-5401 Baden, Switzerland.

The main objective of the research contract of the department of Low Level Counting and nuclear geophysics of the University of Bern with the Nagra (Swiss National Cooperative for the storage of nuclear wastes) is to get informations about groundwater flow in geological formations by the development and application of isotopic methods. By the use of these methods it is possible to get informations about origin, flow paths and residence times of groundwater. Such informations, combined with the results of hydrogeochemical and hydrogeological investigations can be used to get a synthetic picture of the groundwater processes, especially when further combined with hydrodynamic model calculations. The synthesis of the integrated study which includes isotopic and art and the concept of application of the isoregional outflow points and the deep drilled wells together with the results of hydrodynamic simulation models is intended to be used by the Nagra to evaluate the properties and the suitability of geological formations with respect to the construction of a final repository for high level nuclear wastes in the granitic basement. This first report will present an overview of the general state of the art and the concept of application of the isotope methods in hydrology.

50251 **(NAGRA-NTB—84-50) Simulation by a mathematical model of the groundwater flow between the Alps and the Black Forest; Part A: regional model; Part B: local model (Northern Switzerland).** Kimmeier, F.; Perrochet, P.; Andrews, R.; Kiraly, L. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Jan 1985. 178p. (In French). Nagra, CH-5401 Baden, Switzerland.

The purpose of this report is to present the development of two hydrogeologic models of the groundwater flow regime in the crystalline of northern Switzerland. These models are constructed at two scales. The regional model (23000 km/sup 2/) accounts for all recharge to and discharge from the crystalline within the model boundaries. The local model (900 km/sup 2/) allows for greater structural, stratigraphic and topographic complexity in a more restricted area including some of the areas of interest to CEDRA. The regional model provides the hydrologic boundary conditions for the local model. All steps followed in constructing and testing the models are presented. This includes defining the areal and vertical geometry of the principal aquifers and aquitards. In addition, the hydrogeologic properties of these layers are defined; including their permeability, homogeneity, anisotropy and continuity. Discontinuities (e.g. faults) are modeled as discrete features. Hydrologic boundary conditions are specified based on observed or inferred potentiometric or flow (infiltration/exfiltration) data. The developed conceptual models are tested with program FEM 301. The results of this application consist of heads at every noidal point and recharge/discharge rates at every constant head node. These results are utilized to define the general groundwater flow regimes in the crystalline. In addition, the results are compared to observed heads and discharges in an attempt to validate the conceptual models. Representative hydraulic gradients at potential areas of interest to CEDRA are presented. Sensitivity analyses have been conducted to define the groundwater flow systems response to uncertain parameters and boundary conditions.

5204 Thermal Effluents Monitoring And Transport

50252 **(PNL—6309) Evaluation of the potential for fish passage through the N Reactor and the Hanford generating project discharges.** Dauble, D.D.; Vail, L.W.; Neitzel, D.A. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1987. Contract AC06-76RL01830. 13p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014826.

The potential for juvenile downstream-migrating salmonids to encounter both the Hanford Generating Project (HGP) and N Reactor discharges was evaluated. Three general scenarios were assessed for fish exposure: (1) HGP plume centerline passage followed by N Reator plum centerline passage, (2) HGP plume centerline passage including intersection with the N Reactor plume, and (3) noncenterline plume passage through the edge of first the HGP and then the N Reactor plume. It is highly unlikely that a fish would pass through both plume centerlines because of the location of the two discharges and because of river-mixing characteristics near the discharges. For the set of conditions that we evaluated, exposure to elevated temperatures would be of insufficient duration to result in mortalities to fish that might encounter both the HGP and N Reactor plumes.

50253 **(PNL—6310) Downstream extent of the N Reactor plume.** Dauble, D.D.; Ecker, R.M.; Vail, L.W.; Neitzel, D.A. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1987. Contract AC06-76RL01830. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014825.

The downstream extent of the N Reactor thermal plume was studied to assess the potential for fisheries impacts downstream of N Reactor. The N Reactor plume, as defined by the 0.5°F isotherm, will extend less than 10 miles downstream at river flows greater than or equal to annual average flows (120,000 cfs). Incremental temperature increases at the Oregon-Washington border are expected to be less than 0.5°F during all Columbia River flows greater than the minimum regulated flows (36,000 cfs). The major physical factor affecting Columbia River temperatures in the Hanford Reach is solar radiation. Because the estimated temperature increase resulting from N Reactor operations is less than 0.3°F under all flow scenarios, it is unlikely that Columbia River fish populations will be adversely impacted.

5206 Regulations

REFER ALSO TO CITATION(S) 49461, 49673, 50242

50254 **(PB—87-189353/XAB) Superfund Record of Decision (EPA Region 2): Rockaway Borough Well Field, Rockaway Borough, New Jersey, September 1986. Final report.** (Environmental Protection Agency, Washington, DC (USA)). 29 Sep 1986. 61p. (EPA/ROD/R—02-86/034). NTIS, PC A04/MF A01.

The Rockaway Borough Well Field site is located in Rockaway Borough, Morris County, New Jersey, and consists of three municipal supply wells which are in a glacial aquifer designated by EPA as the sole source aquifer for Rockaway Borough and the surrounding communities. High concentrations of TCE and PCE have been detected in the aquifer since 1980, but no sources of contamination have been identified. In 1981, the Borough of Rockaway constructed a three-bed granular activated-carbon adsorption system to treat contaminated well water. Treatment has effectively reduced volatile organic contaminant concentrations in finished water to less than 1 part per billion (ppb). Although thirteen VOCs have been detected in the well water, TCE and PCE are the primary contaminants of concern. The site was listed on the NPL in December of 1982, and the RI/FS was initiated in 1985. The remedial action for the Rockaway Borough site includes maintaining the existing filtration system and modifying operations to ensure compliance with Safe Drinking Water Act standards and EPA continuing the RI/FS in an attempt to identify the source and extent of contamination and evaluate alternatives to address source control. Estimated capital cost of remedial action is zero with annual O&M costs of $74,800.

50255 **(PB—87-190088/XAB) Superfund Record of Decision (EPA Region 4): Distler Farm, Boone, Jefferson County, Kentucky, August 1986. Final report.** (Environmental Protection Agency, Washington, DC (USA)). 19 Aug 1986. 30p. (EPA/ROD/R—04-86/011). NTIS, PC A03/MF A01.

Distler Farm is located in the southwest corner of Jefferson County, KY, approximately one mile northwest of West Point, KY. The three-acre site is approximately 1000 feet from the Ohio River; 600 drums of industrial waste was stored on the ground surface. In December 1978 the Ohio River and its tributaries flooded, causing drums of industrial wastes from the site to be scattered along the flood plain. The Governor of Kentucky declared an environmental emergency and Region IV of the EPA supervised recovery and

onsite storage of 832 drums containing chemicals characteristic of paint and varnish industry. Studies confirmed the evidence of soil contamination and ground water contamination. The primary contaminants of concern include VOCs, PCE, TCE, ketones, toluene, inorganics, radioactive material, and metals. The remedial action includes excavation and removal of all contaminated soils and offsite disposal backfill with clean natural granular soils, extraction of contaminated groundwater and temporary accumulation and onsite storage transportation of contaminated groundwater to offsite commercial facility and treatment to background levels; maintenance of vegetation, erosion repair, and ground-water monitoring for a one-year period. The capital cost is $11,138,400 with O*M in years 1-10 of $113,600 and $20,000 for years 11-30.

53 Social And Economic Studies

REFER ALSO TO CITATION(S) 49280, 49289, 49290, 50227, 50233

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 49389, 49392, 49416

55 BIOMEDICAL SCIENCES, BASIC STUDIES

50256 **(DOE/ER—0346) Annual report and summaries of FY 1987 activities supported by the Division of Biological Energy Research.** (USDOE Office of Energy Research, Washington, DC. Biological Energy Research Div.). Sep 1987. 125p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87014719.

This report briefly describes the mission and divisional research program for the division of Biological Energy Research. This program covers research in bioenergetic systems, plant growth and developmental control, stress response mechanisms, genetic transmission and expression in plants, plant-microbial interactions, and plant cell wall structure and function. The microbiological elements of this program investigate lignocellulosic degradation, fermentation, microbial genetics, energetics and membrane phenomena, thermophily and thermotolerance, microbial ecology association and one- and two-carbon metabolism. (TEM)

5501 Behavioral Biology

REFER ALSO TO CITATION(S) 49418

50257 **(LA-UR—87-2682) Visual evoked responses to sinusoidal gratings presented in central and right visual fields: I.** George, J.S.; Aine, C.J.; Flynn, E.R. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 5p. (CONF-8708121—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014731.

From 6. international conference on biomagnetism; Tokyo, Japan (27 Aug 1987).

The present study applies neuromagnetic measurement techniques to probe the neurophysiological processing of spatial frequency (SF) by normal human observers. By exploiting the temporal and spatial resolution of neuromagnetic measurements, we hope to discriminate and characterize underlying neural functions and explore their correlation with perceptual or behavioral performance measures. Spatial frequency analysis has proven a useful paradigm for the study of visual perception and has been applied in psychophysical studies as well as invasive anatomical and physiological studies of experimental animals. These approaches have produced evidence of specialized neural activity and network structure for the analysis of spatial frequency information. Because the encoding of spatial frequency is a function of neuronal receptive-field size and since receptive-field size varies as a function of retinal location, we have also examined effects of visual field on responses to stimuli of defined spatial frequency content. 10 refs., 3 figs.

50258 **(LA-UR—87-2683) Latency differences and effects of selective attention to gratings in the central and right visual fields: II.** Aine, C.J.; George, J.S.; Flynn, E.R. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 5p. (CONF-8708121—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014730.

From 6. international conference on biomagnetism; Tokyo, Japan (27 Aug 1987).

The goals were to examine the temporal sequence in which visual information (such as visual field, spatial frequency) are processed and to determine whether different neural sources are activated when such features are attended versus not attended. These issues are basic to current models of visual selective attention. 10 refs., 4 figs.

5502 Biochemistry

REFER ALSO TO CITATION(S) 49481, 50215, 50292

50259 **(CONF-8605274—Absts.) Molecular biology of Homo sapiens: Abstracts of papers presented at the 51st Cold Spring Harbor symposium on quantitative biology.** Watson, J.D.; Siniscalco, M. (Cold Spring Harbor Lab., NY (USA)). 1986. Contract FG02-86ER60436. 151p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87011013.

From 51. Cold Spring Harbor symposium on quantitative biology: molecular biology of Homo sapiens; Cold Spring Harbor, NY, USA (28 May 1986).

This volume contains abstracts of papers presented at the 51st Cold Springs Harbor Symposium on Quantitative Biology. The topic for this meeting was the "Molecular Biology of Homo sapiens." Sessions were entitled Human Gene Map, Human Cancer Genes, Genetic Diagnosis, Human Evolution, Drugs Made Off Human Genes, Receptors, and Gene Therapy. (DT)

50260 **(PB—87-212445/XAB) Pyrethroid insecticides and radioligand displacement from the GABA receptor chloride ionophore complex.** Crofton, K.M.; Reiter, L.W.; Mailman, R.B. (Environmental Protection Agency, Research Triangle Park, NC (USA). Health Effects Research Lab.). 1987. 10p. (EPA—600/J-87/050). NTIS, PC A02/MF A01.

Pub. in Toxicology Letters, Vol. 35, 183-190(1987).

Radioligand binding displacement studies were conducted to determine the effects of Type I and II pyrethroids on ^{3}H-flunitrazepam (FLU), ^{3}H-muscimol (MUS), and (^{35}S-t-butylbicyclophosphorothionate (TBPS) binding. Competition experiments with ^{3}H-FLU and ^{3}H-MUS indicate a lack of competition for binding by the pyrethroids. Type I pyrethroids failed to compete for the binding of (^{35}S-TBPS at concentrations as high as 50 pM. Type II pyrethroids inhibited (^{35}S-TBPS binding to rat brain synaptosomes with Ki values ranging from 5-10 pM. The data presented suggest that the interaction of Type II pyrethroids with the GABA receptor-ionophore complex is restricted to a site near the TBPS/picrotoxinin binding site.

50261 **(UCRL—97155) Use of a transfected and amplified Drosophila heat shock promoter construction for inducible production of toxic mouse c-myc proteins in CHO cells.** Wurm, F.M.; Gwinn, K.A.; Papoulas, O.; Pallavicini, M.; Kingston, R.E. (Lawrence Livermore National Lab., CA (USA); Massachusetts General Hospital, Boston (USA). Dept. of Molecular Biology). 24 Jul 1987. Contract W-7405-ENG-48. 29p. (CONF-8704202—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014252.

From European Society of Analytical Cytology and Toxicology meeting; Jerusalem, Israel (6 Apr 1987).

After transfection and selection with methotrexate, CHO cell lines were established which contained up to 2000 copies of an expression vector for c-myc protein. The vector contained the Drosophila heat shock protein 70 (hsp70) promoter fused with the coding region of the mouse c-myc gene. Incubation of cells for up to 3 hours at 43°C resulted in at least a 100-fold induction of recombinant c-myc mRNA. When cells were shifted back to 37°C, within 1 to 4 hours, this RNA was translated into protein to yield about 250

μg per 10^9 cells. Cells died a few hours later, suggesting that high concentrations of intracellular c-myc are cytotoxic. 47 refs., 5 figs.

5503 Cytology

REFER ALSO TO CITATION(S) 50287

50262 **(UCRL—97380) Flow cytometry of sperm.** Gledhill, B.L. (Lawrence Livermore National Lab., CA (USA)). 21 Sep 1987. Contract W-7405-ENG-48. 9p. (CONF-8710152—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000426.

From 6. world congress on human reproduction; Tokyo, Japan (25 Oct 1987).

This brief paper summarizes automated flow cytometric determination of sperm morphology and flow cytometry/sorting of sperm with application to sex preselection. In the latter context, mention is made of results of karyotypic determination of sex chromosome ratios in albumin-processed human sperm. 23 refs., 1 fig., 1 tab.

5504 Genetics

REFER ALSO TO CITATION(S) 50259, 50261

5505 Metabolism

REFER ALSO TO CITATION(S) 49990, 50282, 50312

50263 (INIS-mf—10964, pp 152) **Distribution of nicotinic binding sites in rat brain and human frontal cortex as visualized by autoradiography.** Adem, A.; Nordberg, A.; Haerfstrand, A.; Fuxe, K. (Uppsala Univ., Sweden). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50264 (INIS-mf—10964, pp 160) **Metabolism of /sup 3/H-adrenaline (AD) in the rat brain.** Koester, G. (Bonn Univ., Germany, F.R.). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50265 (INIS-mf—10964, pp 195) **Quantitative autoradiographic distribution of glutamate and aspartate high-affinity uptake system in the rat hippocampal formation during postnatal development.** Schmidt, W.; Wolf, G. (Medizinische Akademie, Magdeburg, German Democratic Republic). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50266 (INIS-mf—10964, pp 197) **Autoradiography of /sup 3/H-D-aspartate in the rat olfactory bulb.** Halasz, N. (Magyar Tudomanyos Akademia, Szeged. Biologiai Kutato Koezpontja). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50267 (INIS-mf—10964, pp 198) **Quantitative autoradiographic characterization of Cl/sup -/independent glutamate binding sites in mouse brain.** Mitsacos, A.; Angelatou, F.; Kouvelas, E.D. (Patras Univ., Greece. Dept. of Physiology). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50268 (INIS-mf—10964, pp 298) **Metabolic mapping of the cerebral effects of benzodiazepines in rats.** Dam, M.; Pizzolato, G.; Ori, C.; Freo, U.; Battistin, L. (Padua Univ., Italy). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50269 (INIS-mf—10964, pp 384) **Histoautoradiographic detection of "in vivo" coursing DNA repair synthesis in different organs of mice.** Hochmann, J. (Research Institute for Organic Syntheses, Pardubice-Rybitvi, Czechoslovakia). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50270 (INIS-mf—10964, pp 385) **Autoradiographic study of DNA synthesis in the brain of adult frogs.** Bernocchi, G.; Scherini, E.; Mares, V. (Dipartimento di Biologia Animale, Centro di Studio per l'Istochimica del C.N.R., Pavia, Italy; Ceskoslovenska Akademie Ved, Prague. Fyziologicky Ustav). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50271 (INIS-mf—10964, pp 385) **Accuracy of autoradiographic H3-DNA retention method for studies of cell formation in the developing brain.** Sykorova, J.; Mares, V. (Ceskoslovenska Akademie Ved, Prague. Fyziologicky Ustav). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50272 (INIS-mf—10964, pp 386) **Long-term follow-up study of /sup 3/H-DNA in Purkinje cell nuclei of the mouse cerebellum after prenatal labelling with /sup 3/H-thymidine.** Mares, V.; Scherini, E.; Schultze-Maurer, B.; Maurer, W. (Ceskoslovenska Akademie Ved, Prague. Fyziologicky Ustav; Department of Animal Biology, University of Pavia, Italy; Wuerzburg Univ., Germany, F.R.). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50273 (INIS-mf—10964, pp 35) **CCK pharmacology in rat during intracranial self stimulation. CCK binding sites in rat and human limbic structures studied by autoradiography.** Vanderhaeghen, J.J.; Goldman, S.; Reeth, O. van; Heidbreder, C.; Witte, Ph. de; Pelaprat, D.; Roques, B.P. (Universite Libre de Bruxelles, Belgium; Louvain Univ., Belgium; Paris-5 Univ., 75, France). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

5506 Medicine

REFER ALSO TO CITATION(S) 50259

50274 (IAEA-TECDOC—410, pp 380-395) **Medical applications of neutron sources.** Broerse, J.J. (Radiobiological Inst. TNO, Rijswijk, Netherlands). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The degree of biological damage produced by ionizing radiation depends on the energy deposition at a macroscopic and a microscopic level. For this purpose the quantities absorbed dose and linear energy transfer (LET) are introduced. Due to the steepness of the dose-effect relations the absorbed dose should be determined with an accuracy of better than +-5 per cent. The uncertainties in the assessment of the absorbed dose are discussed and the results of neutron dosimetry intercomparisons are summarized. Fundamental radiobiological findings have initiated the renewed application of fast neutrons in clinical radiotherapy. At present more than 10,000 patients have been treated with external beams of fast neutrons. Interstitial neutron therapy with californium-252 has been performed at a limited number of centers. For teletherapy with neutron beams with energies below 20 MeV, clinical trials have only shown an advantage for neutrons in comparison with photons for a limited number of tumors. Most of the neutron beams applied for radiotherapy have been less than optimal because of inadequate physical and technical conditions. It is expected that these defects can to a large extent be overcome with neutron beams produced by cyclotrons accelerating protons or deuterons to energies in the range of 40 to 60 MeV. A special aspect of neutron radiotherapy is the installation of low energy filtered reactor beams to be used for boron capture therapy. The large cross section for the /sup 10/B (n,α) / sup 7/Li reaction in the thermal and epithermal energy region could provide a high local energy deposition. The problem of attaching the boron isotope to tumor cells in the human body is under continuous investigation. 53 refs, 13 figs, 3 tabs.

50275 (INIS-BR—838, pp 77) **Nuclear probe microcomputerized system for evaluating left ventricular function.** Piva, R.M.V.; Robilotta, C.C.; Furuie, S.S.; Camargo, E.E. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50276 **(INIS-mf—10964) Molecular basis of neural function. Abstracts.** Tucek, S.; Stipek, S.; Stastny, F.; Krivanek, J. (eds.). (European Society for Neurochemistry). 1986. 33p. (CONF-8609280—Absts.). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561.

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

The conference proceedings contain abstracts of plenary lectures, of young neurochemists' ESN honorary lectures, lectures at symposia and workshops and poster communications. Twenty abstracts were inputted in INIS. The subject of these were the use of autoradiography for the determination of receptors, cholecystokinin, nicotine, adrenaline, glutamate, aspartate, tranquilizers, for distribution and pharmacokinetics of obidoxime-chloride, for cell proliferation, mitosis of brain cells, DNA repair; radioimmunoassay of cholinesterase, tyrosinase; positron computed tomography of the brain; biological radiation effects on cholinesterase activity; tracer techniques for determination of adrenaline; and studies of the biological repair of nerves. (J.P.).

50277 (INIS-mf—10964, pp 34) **Autoradiographic mapping of neurotransmitter receptors in the normal and pathological human brain.** Palacios, J.M.; Cortes, R.; Dietl, M.; Probst, A. (Preclinical Research, Sandoz Ltd., Switzerland; Basel Univ., Switzerland). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50278 (INIS-mf—10964, pp 157) **Immunoaffinity purification and quantitative immunoassay of human brain acetylcholinesterase.** Rakonczay, Z.; Hammond, P.; Brimijoin, S. (Mayo Clinic, Rochester, MN, USA). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50279 (INIS-mf—10964, pp 162) **Detection of hamster tyrosinase by radioimmunoassay.** Vachtenheim, J.; Duchon, J. (Karlova Univ., Prague, Czechoslovakia. Fakulta Vseobecneho Lekarstvi). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50280 (INIS-mf—10964, pp 322) **Kainate affected caudate nucleus in the cat imaged in vivo by positron emission tomography (PET) of /sup 55/CoCl/sub 2/.** Gramsbergen, J.B.P.; Korf, J.; Paans, A.; Vaalburg, W. (Rijksuniversiteit Groningen, Netherlands). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50281 **(INIS-mf—11033) II. symposium of radiological physicists with international participation. Abstracts.** (Ceskoslovenska Lekarska Spolecnost J.E. Purkyne, Prague). 16 Oct 1986. 43p. (CONF-8609339—Absts.). NTIS (US Sales Only), PC A03/MF A01. File Number DE88700238.

From 2. symposium of radiological physicists; Smolenice, Czechoslovakia (22 Sep 1986).

Sponsored by EFOMP.

The symposium proceedings contains 40 brief abstracts of presented papers. The session on treatment planning heard papers on the preparation of patients, calculations of the radiation field, optimization of procedures and computer-aided control of the irradiation process; the session on clinical dosimetry dealt with the techniques of dosimetry in different irradiation procedures; the session on equipment and quality assurance in radiotherapy discussed experience with the use of accelerator and other sources and their calibration; the session on radiation protection problems dealt with the measurement of absorbed dose in the vicinity of the irradiated patient and with spectrometry; a further session dealt with biological problems in radiotherapy. (M.D.).

50282 **(ORNL/TM—10441) Nuclear medicine progress report for quarter ending March 31, 1987.** Knapp, F.F. Jr.; Ambrose, K.R.; Srivastava, P.C. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000024.

Studies using Langendorff-perfused rat hearts have shown for the first time the formation of a polar metabolite from the methyl-branched fatty acid, BMIPP. Evaluation of the radioactive components in the outflow tract of hearts after administration of the straight-chain analogue [I-131]IPPA and [I-125]BMIPP were pursued. Analysis of lipid extracts by thin-layer chromatography illustrated the presence of a product considerably more polar than BMIPP. These results suggest for the first time that the slow myocardial clearance observed with BMIPP in clinical studies may be associated with the wash-out of an unidentified metabolite. As a continuation of an evaluation of the effects of tellurium (Te) heteroatom position and the position of alkenyliodide substitution on myocardial uptake and retention properties, several new Te fatty acids have been synthesized and studied in rats. The new agents

were prepared by coupling of internal alkenyl iodides prepared from the corresponding boronic acid analogues with sodium alkoxycarbonyl tellurols. Evaluation of the four new analogues demonstrated an unexpected relationship between chain length, and the position of the Te heteroatom and alkenyliodide moiety. 5 figs., 1 tab.

50283 **Samarium-145: a new brachytherapy source.** Fairchild, R.G.; Packer, S.; Wielopolski, L.; Laster, B.H.; Mausner, L.; Kalef-Ezra, J.; Robertson, J.S.; Kanellitsas, C. (Brookhaven National Lab., Upton, NY, USA; Ioannina Univ., Greece; Department of Energy, Washington, DC, USA; Ohio State Univ., Columbus, USA). *Physics in Medicine and Biology;* **32**: No. 7, 847-858(Jul 1987).

A new radiation source has been produced for brachytherapy, with radiation energies slightly above those of ^{125}I, and a Tsub(1/2) of 340 d. This source, ^{145}Sm, is produced by neutron irradiation of ^{144}Sm (96.5% enriched). Decay is by electron capture with 140 K x-rays per 100 disintergrations in the energy region between 38-45 keV, plus 13 γ-rays at 61 keV. These sources are encapsulated in Ti tubes, approx. 0.8 mm x 4.5 mm, and have been developed for temporary implantation in brain and ocular tumours. The 38-61 keV photons should make such sources easy to shield, while providing a dose distribution from source arrays somewhat more homogeneous than that from ^{125}I. In addition, the 340 d half life of ^{145}Sm permits its use for times significantly longer than that of 60 d ^{125}I. While the ^{145}Sm sources have been designed primarily for implantation in a brain tumour, they should be useful for almost any conventional brachytherapy application.

50284 **Measurement of lung volume with ^{81}Krsup(m) in a dynamic scintigram.** Cinotti, L.; Susskind, H.; Zubal, I.G.; Bennett, G.W.; Slosman, D.; Brill, A.B.; Meignan, M. (Brookhaven National Lab., Upton, NY, USA; Centre Hospitalier Universitaire, 94 - Creteil, France). *Nuclear Medicine Communications;* **8**: No. 7, 479-488(Jul 1987).

The meaning of ^{81}Krsup(m) counts obtained in a dynamic series of gated lung ventilation scans was evaluated in terms of flow rate, lung volume, or the flow/volume ratio. Flow and volume signals were recorded together with scintigraphic events in 29 subjects breathing ^{81}Krsup(m) and after its decay, ^{127}Xe as a tracer of lung volume. Gated ventilation scans and respiratory signals were reconstructed. Statistical analyses were carried out for linear regressions between total normalized counts detected by the gamma camera and (1) flow rate, (2) lung volume and (3) flow/volume ratio. Inspiration and expiration were analysed separately. For both isotopes, the best correlation was obtained between counts and lung volume ($r > 0.93$). No correlation was obtained between counts and flow rate or flow/volume ratio. Thus, we conclude that ^{81}Krsup(m) count variations in gated scans correlate well with tidal volume.

50285 **No-carrier-added (NCA) (+-)-N-(3-[^{18}F]fluoropropyl)-N-normetazocine-synthesis and PET studies in a baboon.** Chyhg-yann Shiue; Ren-rui Teng; Lan-qin Bai; Wolf, A.P.; Arnett, C.D.; Simon, E.J. (Brookhaven National Lab., Upton, NY, USA; New York Univ., NY, USA. Medical Center). *Nuclear Medicine and Biology;* **14**: No. 2, 119-122(1987).

No-carrier-added (NCA) (+-)-N-(3-[^{18}F]Fluoropropyl)-N-normetazocine (2) was synthesized by N-alkylation of (+-)-N-normetazocine (1) with NCA 1-[^{18}F]fluoro-3-iodopropane in an overall radiochemical yield of 10% (EOB) with a mass of 3.5 nmol in a synthesis time of 90 min from end of bombardment (EOB). PET studies of 2 in a baboon did not indicate specificity for opiate receptor sites alone: The activity declined rapidly in the striatum, the frontal cortex and the cerebellum. The baboon total arterial plasma radioactivity clearance was very rapid and the metabolism of compound 2 in plasma was also very rapid. These results suggest that compound 2 is not a suitable radioligand for imaging opiate receptors in the human brain by positron tomography.

5507 Microbiology

REFER ALSO TO CITATION(S) 49275

50286 **(INIS-BR—822) Comparison between crystals of two magnetostatic microorganisms.** Souza, M.F. de; Sollorzono, G.; Vieira, G.J. (Sociedade Brasileira de Microscopia Eletronica, Rio de Janeiro). 1985. 1p. (In Portuguese). (CONF-8509411—2-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703719.

From 10. colloquium of the Brazilian Society of Electron Microscopy; Sao Paulo, Brazil (1 Sep 1985).

Published in summary form only.

50287 **(INIS-BR—823) Determination of the dense grains composition in Crithidia oncopelti and Blastocrithidia culicis by ultrastructural cytochemistry and X-ray microanalysis.** Soares, M.J.; Souza, M.F. de; Souza, W. de. (Sociedade Brasileira de Microscopia Eletronica, Rio de Janeiro). 1985. 1p. (In Portuguese). (CONF-8509411—3-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703720.

From 10. colloquium of the Brazilian Society of Electron Microscopy; Sao Paulo, Brazil (1 Sep 1985).

Published in summary form only.

5509 Pathology

50288 **(INIS-BR—739) Formation of ester from cholesterol -4- c/sup 14/ in the liver of normal mice and mice infected by Schistosoma mansoni.** Soares, M.G.C.B.; Borges, S.S. (Pernambuco Univ., Recife (Brazil). Dept. de Biofisica e Radiobiologia). 1986. 1p. (In Portuguese). (CONF-861298—3-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703491.

From 5. regional symposium on biophysics; Recife, PE, Brazil (6 Dec 1986).

Published in summary form only.

50289 (INIS-mf—10964, pp 153) **Pharmacokinetics and distribution of obidoxime-chloride in organophosphate intoxication.** Streichenberg, C.; Waser, P.C. (Zurich Univ., Switzerland). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

5510 Physiological Systems

REFER ALSO TO CITATION(S) 50257, 50258

50290 (INIS-mf—10964, pp 295) **Distribution of fats axonal transport in repaired nerves.** Frizell, M.; Danielsen, N. (Sahlgren Hospital, Goeteborg, Sweden. Departments of Neurology and Anatomy). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

5530 Agriculture And Food Technology

50291 **(INIS-BR—678) Radioresistance and radiosensitivity in Drosophila melanogaster.** Reguly, M.L. (Rio Grande do Sul Univ., Porto Alegre (Brazil)). 1983. 284p. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703438.

Studying the mechanisms controlling radioresistant in Drosophila the sensibility of four strains of Drosophila melanogaster to sex-linked recessive lethal mutations induced by 5kR Cobalt-60

gamma radiation and 0,006 M EMS or 0,25% of caffeine was determined. (M.A.C.).

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

REFER ALSO TO CITATION(S) 50256

5601 Radiation Effects

REFER ALSO TO CITATION(S) 50292

50292 **(BNL—40073) DNA damage and repair in human skin in situ.** Sutherland, B.M.; Gange, R.W.; Freeman, S.E.; Sutherland, J.C. (Brookhaven National Lab., Upton, NY (USA); Harvard Medical School, Boston, MA (USA). Dept. of Dermatology). 1987. Contract AC02-76CH00016. 12p. (CONF-8707103—1). NTIS, PC A02. File Number DE87014288.

From International conference on DNA damage and repair; Rome, Italy (12 Jul 1987).

Understanding the molecular and cellular origins of sunlight-induced skin cancers in man requires knowledge of the damages inflicted on human skin during sunlight exposure, as well as the ability of cells in skin to repair or circumvent such damage. Although repair has been studied extensively in procaryotic and eucaryotic cells - including human cells in culture - there are important differences between repair by human skin cells in culture and human skin in situ: quantitative differences in rates of repair, as well as qualitative differences, including the presence or absence of repair mechanisms. Quantitation of DNA damage and repair in human skin required the development of new approaches for measuring damage at low levels in nanogram quantities of non-radioactive DNA. The method allows for analysis of multiple samples and the resulting data should be related to behavior of the DNA molecules by analytic expressions. Furthermore, it should be possible to assay a variety of lesions using the same methodology. The development of new analysis methods, new technology, and new biochemical probes for the study of DNA damage and repair are described. 28 refs., 4 figs.

50293 **(CNIC—00017) Study on behavior of fluorine-18 in Tilapia.** He Xinruo; Fan Guangyu; Bai Suozhen; Diao Guoping; Dong Guizhi; Zhang Weiqin; Cao Weiqin; Wu Zengxin; Wang Yingyan; Liu Ming. (China Nuclear Information Centre, Beijing, BJ). 1986. 16p. (In Chinese). (IAE—0011). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703385.

The metabolism of fluorine in Tilapia was investigated by using fluorine-18 as tracer. For Tilapia, the fluorine was taken from water by digestive system, gills and skin, then spread to whole body. The amount of fluorine-18 accumulated in various tissues of Tilapia is considerably different. The highest is in the scale. The lowest is in the muscle and fat. The middle is in the liver, kidney and heart. The excretion of fluorine-18 is released into water body by kidney, gills and skin. The more it was taken, the more it was released.

50294 **(DOE/ER/60510—T1) An immunochemical approach to the study of DNA damage and repair: Technical progress report, August 1, 1986 to July 31, 1987.** (New York Medical Coll., Valhalla (USA). Dept. of Microbiology and Immunology). 1987. Contract FG02-87ER60510;AC02-80EV10417. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014803.

Immunochemical methods are being developed to quantitate unique DNA base damages in x-irradiated DNA. The approach is to chemically synthesize modified nucleotides, conjugate them to protein carriers, and use the conjugates as immunogens in rabbits. Several thymine ring saturation or fragmentation products have been chosen as models for pyrimidine radiolysis products. These include thymine glycol, dihydrothymine and urea. The characterized antibodies are used to quantitate DNA damage x-irradiated in vitro and to immunochemically characterize the antibody to dihydrothymine. 12 refs., 1 fig., 1 tab.

50295 **(INIS-BR—737) Effects of gamma radiation and neutron radiation on the membrane resistance of trypanosomatidae.** Leao, M.A.C. (Pernambuco Univ., Recife (Brazil). Dept. de Biofisica e Radiobiologia). 1986. 1p. (In Portuguese). (CONF-861298—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703489.

From 5. regional symposium on biophysics; Recife, PE, Brazil (6 Dec 1986).

Published in summary form only.

50296 **(INIS-BR—738) Influence of different doses of gamma radiation on the development of reproduction capacity of mice.** Leao, M.A.C. (Pernambuco Univ., Recife (Brazil). Dept. de Biofisica e Radiobiologia). 1986. 1p. (In Portuguese). (CONF-861298—2-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703490.

From 5. regional symposium on biophysics; Recife, PE, Brazil (6 Dec 1986).

Publishid in summary form only.

50297 **(INIS-mf—10703) Spectroscopy and dosimetry of silver-L radiation for biophysical applications.** Modler, H. (Goettingen Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fachbereiche). 2 Nov 1984. 127p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE87752887.

In order to carry out biological radiation experiments with low energy electrons, whose limited range as a rule even for single cell layers is not sufficient to pass through the cytoplasm to the nucleus, one must work with low energy X-rays. The electrons which are released directly in the cell by the photo effect are then the biologically active, directly ionized particles, whose starting spectrum can be determined by the selection of the photon spectra. The problem was to build an apparatus for irradiation of thin cell layers with low energy X-rays, which contained a large portion of the silver-L lines at approximately 3 keV, as well as to carry out the necessary spectrometry and dosimetry with the silver anode tubes and to optimize the irradiation parameters.

50298 **(INIS-mf—10704) Increase of uric acid synthesis in irradiated chicken's embryos.** Loyda, H.J. (Bonn Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 19 Dec 1984. 60p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87752888.

Several important intermediate and end products of uric acid metabolism as well as their corresponding enzymatic reactions were studied in 16 day-old chicken embryos which had been one or more times irradiated or respectively treated with ammonium chloride. After sublethal X-irradiation and at the time of the second irradiation with 800 R, the activity of the glutamine synthetase and the xanthin dehydrogenase in the kidneys of the embryos was increased. In contrast to this the glutamate dehydrogenase activity was moderately decreased. Two hours after the main irradiation the uric acid values as well as the amount of fixed nitrogen in the blood serum of previously-irradiated embryos are noticeably higher than the comparative data in non-previously irradiated animals. The glutamic acid values increase after the second irradiation, but still remain lower than with the non-previously irradiated animals. I achieved concuring ressults when I treated the embryos with ammonium chloride instead of radiation.

50299 (INIS-mf—10964, pp 156) **Changes of acetylcholinesterase activity in different parts of the rabbit brain following different types of irradiation (uniform and non-uniform).** Skopec, F.; Bajgar, J. (Purkyne Medical Research Institute, Hradec Kralove, Czechoslovakia). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50300 (INIS-mf—10964, pp 285) **Properties of La/sup 3+/-induced /sup 45/Ca/sup 2+/ uptake in human red blood cells.** Varecka, L.; Peterajova, E.; Pogady, J. (Psychiatric Hospital, Pezinok, Czechoslovakia. Mental Health Research Center of the Institute of Medical Bionics). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50301 (INIS-mf—10964, pp 161) **/sup 3/H isotope effects on the metabolism of adrenaline (AD) in rat brain.** Koester, G. (Bonn Univ., Germany, F.R.). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703561. (CONF-8609280—Absts.).

From Congress of European Society for Neurochemistry; Prague, Czechoslovakia (1 Sep 1986).

Excerpts only.

50302 (MBL—1986-7) **Influence of oxygen on the induction of radiation damage in DNA in mammalian cells after sensitization by intracellular glutathione depletion.** Schans, G.P. van der; Vos, O.; Roos-Verheij, W.S.D.; Lohman, P.H.M. (Gezondheidsorganisatie TNO, Rijswijk (Netherlands). Medisch Biologisch Lab.). May 1986. 28p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703633.

Treatment of mammalian cells with buthionine sulphoximine (BSO) or diethyl maleate (DEM) results in a decrease in the intracellular GSH (glutathione) and NPSH (non-protein-bound SH) levels. The effect of depletion of GSH and NPSH on radiosensitivity was studied in relation to the concentration of oxygen during irradiation. Single- and double-strand DNA breaks (ssb and dsb) and cell killing were used as criteria for radiation damage. Under aerobic conditions, BSO and DEM treatment gave a small sensitization of 10-20% for the 3 types of radiation damage. Also under severely hypoxic conditions (0.01 μM oxygen in the medium) the sensitizing effect of both compounds on the induction of ssb and dsb and on cell killing was small (0-30%). At somewhat higher concentrations of oxygen (0.5-10 μM) however, the sensitization amounted to about 90% for the induction of ssb and dsb and about 50% for cell killing. These results strengthen the widely accepted idea that intracellular SH-compounds compete with oxygen and other electron-affinic radiosensitizers with respect to reaction with radiation-induced damage, thus preventing the fixation of DNA damages by oxygen. These results imply that the extent to which SH-compounds affect the radiosensitivity of cells in vivo depends strongly on the local concentration of oxygen. (Auth.). Includes Dutch summary; 30 refs.; 6 figs.; 1 table.

50303 (MBL—1986-8) **Reduction of intracellular glutathione content and radiosensitivity.** Vos, O.; Schans, G.P. van der; Roos-Verheij, W.S.D. (Gezondheidsorganisatie TNO, Rijswijk (Netherlands). Medisch Biologisch Lab.). May 1986. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703634.

Includes Dutch summary; 35 refs.; 2 figs.; 3 tabs.

The intracellular glutathione (GSH) content in HeLa, CHO and V79 cells was reduced by incubating the cells in growth medium containing buthionine sulfoximine (BSO) or diethyl maleate (DEM). Clonogenicity, single strand DNA breaks (SSB) and double strand DNA breaks (DSB) were used as criteria for radiation induced damage after X- or γ irradiation. In survival experiments DEM gave a slightly larger sensitization although it gave a smaller reduction of the intracellular GSH. In general, sensitization was larger for dsb than for ssb, also the reduction of the OER was generally larger for dsb than for ssb. This may be due to the higher dose rate in case of dsb experiments resulting in a higher rate of radiochemical oxygen consumption. In general, no effect was found on post-irradiation repair of ssb and dsb. (Auth.). Includes Dutch summary; 35 refs.; 2 figs.; 3 tabs.

50304 (NUREG/CR—4951) **Nephrotoxicity of uranyl fluoride and reversibility of reval injury in the rat.** Diamond, G.L.; Gelein, R.M.; Morrow, P.E.; Panner, B.J.; Baggs, R.B. (Rochester Univ., NY (USA). School of Medicine and Dentistry; Nuclear Regulatory Commission, Washington, DC (USA). Div. of Regulatory Applications). Sep 1987. 101p. NTIS, PC A06/MF A01 - GPO. File Number DE87900991.

This study examined the severity and duration of renal injury produced in the rat from exposure to low levels of uranyl fluoride (UO_2F_2). Rats received multiple i.p. injections of UO_2F_2 (cumulative dose: 0.66 or 1.32 mg U/kg body wt). Renal injury was characterized primarily by cellular and tubular necroses of the pars recta of the proximal tubule (S_2 and S_3), with less severe cellular injury to the thick ascending limb of the loop of Henle and collecting tubule. The injury was apparent early in the dosing phase of the study, at a time when renal uranium levels were between 0.7 to 1.4 μg U/g, and was most severe when the renal uranium burden was between 3.4 to 5.6 μg U/g. Repair of the injury was rapid, with complete restoration within 35 days after the exposure. Associated with the injury were numerous abnormalities in kidney function, including impaired tubular reabsorption, proteinuria and enzymuria, which appeared to be temporally related, to variable degrees, to the progression of renal injury. Thus, reversible renal injury occurred in the rat at levels of uranium in kidney below the proposed threshold standard for renal injury in humans of 3 μg U/g kidney. However, renal injury preceded and outlasted functional abnormalities as assessed by urinalysis and clearance measurements. 28 refs., 35 figs., 7 tabs.

50305 (PSD—87, pp SL/22) **Positron annihilation studies of age-induced changes in animal lenses.** Hsu, F.H.; Wen, B.G.; Kuck, J.F.R.; Yu, N.Y. (Georgia State Univ., Atlanta, USA. Dept. of Physics and Astronomy; Emory Univ., Atlanta, GA, USA; Georgia Inst. of Tech., Atlanta, USA. School of Chemistry). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50306 (RERF-TR—15-85) **Effects of /sup 60/Co gamma radiation on defense function of human polymorphonuclear leukocytes.** Sasagawa, Sumiko; Suzuki, Kazuo; Sakatani, Tatsuichiro; Brooks, G.T.; Fujikura, Toshio. (Radiation Effects Research Foundation, Hiroshima (Japan)). Jun 1986. 12p. (In Japanese and English). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703652.

The effects of radiation on defense function of polymorphonuclear leukocytes (PMN) were studied following irradiation with / sup 60/Co γ radiation (30 - 3,000 rad) using PMN separated from the peripheral blood of healthy volunteers. The migration distances for all three measures of chemotaxis to fMet-Leu-Phe (10/sup -8/ M), chemokinesis induced by fMet-Leu-Phe, and random migration tended to decrease with increasing dose, showing 0.0054 μm/rad ($p < 0.001$) for chemotaxis, and 0.0018 μm/rad ($p = 0.005$) for both chemokinesis and random migration. For releases of β-glucuronidase (BGL) and lysozyme (LYZ) from PMN stimulated by fMet-Leu-Phe (10/sup -5/ M) in conjunction with cytochalasin B (CB, 5 μg/ml) there was a significant dose trend, showing the dose effects of decreasing 0.0022% release/rad for BGL and 0.0030% release/rad for LYZ with increasing dose. In superoxide anion (O/sub 2// sup -/) production, a slight and marginally significant linear dose trend was found. These results suggest that the defense function of PMN is not so resistant to radiation as predicted from the fact that PMN in the peripheral blood are differentiated and mature. It is thought that radiation inflicts substantially harmful effects on the defense function of peripheral PMN.

50307 **(RERF-TR—22-84) Incidence of stroke and coronary heart disease in the adult health study sample, 1958-1978.** Kodama, Kazunori; Shimizu, Yukiko; Sawada, Hisao; Kato, Hiroo. (Radiation Effects Research Foundation, Hiroshima (Japan)). Apr 1986. 22p. (In Japanese and English). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703653.

Approximately 16,000 study subjects in the Adult Health Study sample who had received examination at least once during the 20 years (1958-1978) in Hiroshima or Nagasaki and were found to have neither stroke nor coronary heart disease (CHD) at the initial examination were studied for the incidence of stroke and CHD and the relationship of these to atomic bomb radiation exposure. Their secular trends were also studied. Findings suggestive of a relationship between stroke and radiation exposure among Hiroshima females were first discovered for the years 1969-1973, that is, 24-28 years after A-bomb exposure. In general, this association is supported by the present analysis. Stroke incidence continued to decrease during the present report's period of observation. Analysis by type showed that cerebral infarction and cerebral hemorrhage both decreased, but the decrease of the latter is especially remarkable. The trend to decrease is observed in both sexes and in both cities. A relationship between CHD and radiation exposure was, as noted for stroke, first observed only in Hiroshima females for the years 1969-1973, but from this analysis it appears that the trend began earlier and the association is getting stronger with the passage of time. Analysis by type showed myocardial infarction (MI), but not angina pectoris, to be related to radiation exposure. The incidence rate for CHD, especially for MI, was almost constant during the observation period, it being 1.2/1,000 person-years on the average. Comparing by sex, the incidence rate was constant in males. In females, the pattern varied with time. There appear to be no between-city differences in secular trends - essentially constant.

50308 **(UCRL—15928) A case-control study of malignant melanoma among Lawrence Livermore National Laboratory employees: A critical evaluation.** Kupper, L.L.; Setzer, R.W.; Schwartzbaum, J.; Janis, J. (Livermore Melanoma Project Partnership, Chapel Hill, NC (USA); Lawrence Livermore National Lab., CA (USA)). 1 Jul 1987. Contract W-7405-ENG-48. 169p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87013512.

This document reports on a reevaluation of data obtained in a previous report on occupational factors associated with the development of malignant melanomas at Lawrence Livermore National Laboratory. The current report reduces the number of these factors from five to three based on a rigorous statistical analysis of the original data. Recommendations include restructuring the original questionnaire and trying to contact more individuals that worked with volatile photographic chemicals. 17 refs., 7 figs., 22 tabs. (TEM)

50309 **Brain cancer and nonoccupational risk factors: a case-control study among workers at two nuclear facilities.** Carpenter, A.V.; Flanders, W.D.; Frome, E.L.; Cole, P.; Fry, S.A. (Oak Ridge Associated Universities, TN). *American Journal of Public Health;* **77**: No. 9, 1180-1182(Sep 1987).

In a nested case-control study of nuclear workers, 82 brain cancer cases were compared with 328 matched controls to investigate the possible association with nonoccupational risk factors such as histories of epilepsy or head injury. We observed a moderately strong association between brain cancer occurrence and history of epilepsy (OR = 5.7, 95 per cent CI: 1.0, 32.1), but did not find a positive association with previous head injury (OR = 0.9, 95 per cent CI: 0.2, 4.2).

50310 **Chronic radiation leukemogenesis: postnatal hematopathologic effects resulting from in-utero irradiation.** Seed, T.M.; Kaspar, L.V.; Tolle, D.V.; Fritz, T.E. (Argonne National Lab., IL). *Leukemia Research;* **11**: No. 2, 171-179(1987).

We examined leukemic incidences and postnatal hematopoietic function in three groups of dogs: (i) continuously irradiated during both fetal life and after birth, (ii) continuously irradiated during fetal life only, and (iii) nonirradiated. Hematopoietic function was assessed in terms of both (a) circulating blood levels of red cells, platelets, granulocytes, and monocytes, and (b) marrow concentrations and radiosensitivities of hematopoietic progenitors. Results indicated that under continous fetal/postnatal irradiation, i.e. the high leukemogenic exposure regimen, a marked, progressive suppression in hematopoietic function occurred following birth. This suppression continued to 100-150 days of age and was followed by partial hematopoietic recovery that was associated with an acquired radioresistance by hematopoietic progenitors. In contrast, neonates that had been continuously irradiated during fetal life, but not postnatally, i.e. the low leukemogenic regimen, exhibited a similar initial suppression of hematopoietic function followed by partial recovery. However, no temporally linked acquisition of radioresistance by hematopoietic progenitors was demonstrated.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 50228

5603 Chemicals Metabolism And Toxicology

REFER ALSO TO CITATION(S) 49283, 50211, 50214, 50215, 50217, 50227, 50229, 50233, 50245

50311 **(DOE/ER/60174—2) Development of an in vitro assay for teratogens: Final report, 1 July 1983 to 31 August 1986.** Braun, A.G. (Massachusetts Inst. of Tech., Cambridge (USA)). 1987. Contract AC02-83ER60174. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014530.

The objectives of the work were to apply an in vitro teratogen assay system to samples of fossil fuel combustion products and to extend the assay system by incorporating metabolic activation. Potential teratogenicity was measured by the ability of a test compound to inhibit the attachment of tumor cells to lectin coated plastic surfaces.

50312 **(DOE/EV/03140—10) The toxicology and metabolism of nickel compounds: Final technical progress report for the period from 1 December 1985 to 31 August 1987.** Sunderman, F.W. Jr. (Connecticut Univ., Farmington (USA). School of Medicine). 1 Sep 1987. Contract AC02-76EV03140. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87014801.

The toxicology of nickel compounds was investigated in rats and the metabolism of nickel was studied in humans. Lipid peroxidation is one of the molecular mechanisms of acute toxicity of $NiCl_2$ in rats. The thymus is a target organ of acute nickel toxicity, as evidenced by the thymic involution that occurs within 24 hours after parenteral administration of $NiCl_2$ to rats. The lung is the primary target organ of subacute nickel toxicity in rats, as manifested by marked bronchoalveolar proliferation and degenerative changes in the pulmonary vascular endothelium of rats after 3 to 6 weeks of daily sc injections of $NiCl_2$. Electrothermal atomic absorption spectrophotometry with Zeeman background correction provides an accurate, sensitive, and practical routine method for analysis of nickel concentrations in body fluids and tissues of human subjects to monitor environmental, occupational, or iatrogenic exposures to nickel compounds. 11 refs.

50313 **(ORNL—6392) Update of acute and chronic aquatic toxicity data for heavy metals and organic chemicals found at hazardous waste sites.** Etnier, E.L.; Meyer, R.E.; Lewis, E.B.; Folmar, L.C. (Oak Ridge National Lab., TN (USA)). Jun 1987. Contract AC05-84OR21400. 213p. NTIS, PC A10. File Number DE88000184.

The purpose of this review is to provide updated acute and chronic aquatic toxicity data for 36 of the chemicals and metals most commonly found in ground and surface water at hazardous waste disposal sites around the United States. The aquatic toxicity data includes the bioconcentration factor, the effective concentration causing a specified response in 50% of the study population (EC_{50}), the concentration causing mortality in 50% of a given population (LC_{50}), and the concentration causing an effect in any fraction (often unspecified) of a study population (EFC).

5604 Other Environmental Pollutant Effects

REFER ALSO TO CITATION(S) 50246

58 GEOSCIENCES

50314 **(INIS-mf—10962) Nuclear methods in mining, geology, geophysics and geochemistry. VIth seminar. Abstracts of papers.** (Ceskoslovenska Akademie Ved, Prague. Ustav Geologie a Geotechniky; Ceskoslovenska Komise pro Atomovou Energii, Prague). 1986. 32p. (In Czech). (CONF-8509338—Absts.). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703559.

From Nuclear methods in mining, geology, geophysics and geochemistry; Marianska u Jachymova, Czechoslovakia (23 Sep 1985).

The publication contains 23 abstracts of submitted papers. The topics include: the interpretation of rock isotope dating, the applications of radiation detectors and spectrometry, the application of radionuclide X-ray fluorescence analysis and of neutron and gamma logging in mining and geology. (J.P.).

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 49366, 49423, 49672, 50248

50315 **(INIS-BR—747) Geochronological study of the metaconglomerates of the Sao Roque Group, Sao Paulo State.** Tassinari, C.C.G.; Kawashita, K.; Kikuchi, R.K.P. de. (Sociedade Brasileira de Geologia, Sao Paulo). 1985. 17p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703499.

This work deals with the geochronological study of the metaconglomerates of the Sao Roque Group by Rb-Sr whole rock measurements and K-Ar method in minerals concentrate. The granite-gneissic pebbles from the metaconglomerates have been analysed by Rb-Sr isochronic method and yelded an age of 1200+100 Ma. with a /sup 87/Sr//sup 86/Sr intercept of 0.737/sup +-/ 0.003. In our view this age might be associated to the metamorphic episode affecting the pre-existent granitic rocks before the epoch of the Sao Roque group sedimentation, or to the original age of the pebbles. The analytical points from the conglomerate matrix seem to define a linear array with 800Ma. This age, probably, represents the epoch of the main metamorphic event on the Sao Roque Group. The K-Ar micas determinations on rocks of the unit in study are concordant in ages, with values around 620. These ages represent the tectonic estabilization epoch of the Pico de Jaragua region.

50316 **(INIS-BR—752) Hydrochemical and isotopic studies of ground water from Botucatu Aquifer - Partial results for North region of Parana Basin.** Silva, R.B.G. da; Kimmelmann, A.A.; Cunha Reboucas, A. da. (Sociedade Brasileira de Geologia, Sao Paulo). 1985. 14p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703699.

The first results of an investigation, to study the flow path, the processes controlling the chemical composition, the recharge, as well as, the origin, apparent ages and dynamic of the groundwater of the Botucatu Aquifer in the Brazilian part of the Parana Basin (818.000 Km/sup 2/), using hydrochemical and environmental isotope technics (/sup 2/H, /sup 18/O, /sup 13/C, /sup 3/H, /sup 14/C), are presented. Samples of 20 deep wells, located in the northern part of the Basin (states of Sao Paulo, Mato Grosso do Sul and Goias), were analysed.

50317 **(INIS-BR—753) Contribution to the geochronological pile of the setentrional portion of Ribeira folded belt.** Batista, J.J.; Kawashita, K. (Sociedade Brasileira de Geologia, Sao Paulo). 1985. 14p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703503.

Six new Rb-Sr isochrons on samples of rocks of the setentrional portion of the Ribeira folded belt are presented and discussed with others geochronological and geological data. The main object of this study is the search of the understanding of the geodynamic evolution of this Region using the Rb-Sr method. The results obtained for the K-Ar and U-Pb, in other papers, are also commented on. The integrated analysis of the date deals with the charnocketic, gneissic - migmatitic and magmatic rocks. All the data are refered to the Brasiliano cicle (Upper Precambrian), and thus, the geochronological pattern points out to an important event in the generation of the geologic processes for the Brasilian geotectonic unit.

50318 **(INIS-BR—845) Geochemistry of rare earths and oxygen isotopes in granitic rocks from Monte das Gameleiras and Dona Ines, Rio Grande do Norte-Paraiba border, Brazil.** Sial, A.N.; Galindo, A.C.; Araujo, M.E. (Sociedade Brasileira de Geologia, Sao Paulo). 1984. 12p. (In Portuguese). (CONF-8405436—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700024.

From 11. symposium of geology in northwest; Natal, Brazil (1 May 1984).

The study of oxygen isotopes and rare earth elements in granitic plutons of Monte das Gameleiras and Dona Ines, Rio Grande do Norte-Paraiba border, in Brazil, to define the nature of source rock of progenitor magmas, is presented. (M.C.K.).

50319 **(INIS-BR—847) Additional aspects of facies determination of the Souza Formation.** Vasconcelos, E.C.; Mabesoone, J.M. (Sociedade Brasileira de Geologia, Sao Paulo). 1984. 15p. (In Portuguese). (CONF-8405436—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700025.

From 11. symposium of geology in northwest; Natal, Brazil (1 May 1984).

By means of geochemical analysis of total sample and trace elements, x-ray and DTA investigation of the clay fractions, and microfanes study, obtained by the facies determination of the Souza Formation, some additional aspects giving evidence of the sequence of events responsable by origin, deposition and formation of sediments of this middle unit of the Rio do Peixe group were established.

50320 **(INIS-BR—848) Rb-Sr dating in orthogneisses and the age of Serido group, Brazil.** Macedo, M.H.F.; Sa, E.F.J. de; Sa, J.M. (Sociedade Brasileira de Geologia, Sao Paulo). 1984. 10p. (In Portuguese). (CONF-8405436—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703742.

From 11. symposium of geology in northwest; Natal, Brazil (1 May 1984).

The conclusions of the geochronologic study, by Rb-Sr method, of orthogneisses from Serido Group, Northeast of Brazil, are presented. Metamorphic and granitic rocks were analysed by X-ray fluorescence, to determine the Rb and Sr quantity. (M.C.K.).

50321 **(INIS-BR—849) Monocyclic supracrustals at far west of Rio Grande do Norte, in Brazil.** Sa, E.F.J. de; Macedo, M.H.F.; Sa, J.M.; Kawashita, K. (Sociedade Brasileira de Geologia, Sao Paulo). 1986. 13p. (In Portuguese). (CONF-8605294—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700026.

From 12. symposium of geology in northwest; Joao Pessoa, Brazil (1 May 1986).

A geochronological study of supracrustals and intrusive rocks from Rio Grande do Norte, in Brazil, is presented. Leucogranites and felsic metavolcanics were dated by Rb-Sr method. A summary of geologic relationship is given to supply the geochronological interpretation. (M.C.K.).

50322 **(INIS-BR—850) Contribution to the study of geochronological evolution of Troia Massif-CE, in Brazil.** Pessoa, R.R.; Pessoa, D.R.; Brito Neves, B.B. de; Kawashita, K.; Fuck, R.A. (Sociedade Brasileira de Geologia, Sao Paulo). 1986. 19p. (In Portuguese). (CONF-8605294—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703743.

From 12. symposium of geology in northwest; Joao Pessoa, Brazil (1 May 1986).

The geochronological study of the Massif of Troia-CE, Brazil, for identifying different parastratigraphic units is presented. A previous selection by macroscopic, microscopic and X-ray fluo-

rescence analysis for Rb/Sr determinations in whole rock, and K/Ar determinations in mineral was carried out. (M.C.K.).

50323 (INIS-BR—851) Geochronological and chemical surveys of Maracau subvolcanic province - Folha de Santa Quiteria (CE, in Brazil). Torquato, J.R.F.; Pedreira, L.H.; Cavalcanti, V.M.M. (Sociedade Brasileira de Geologia, Sao Paulo). 1986. 15p. (In Portuguese). (CONF-8605294—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703744.

From 12. symposium of geology in northwest; Joao Pessoa, Brazil (1 May 1986).

The regional geology and geochronological and chemical characteristics of Maracau-CE, in Brazil, subvolcanic province are described. The Brazilian ages of implantation and regional geology are discussed together with the chemical constitution of various lithologic types: the origin and correlation with other subvolcanic provinces in Ceara State are considered.

50324 (INIS-BR—852) Tectonic evolution of Southern part of the Sao Francisco Craton. Teixeira, W. (Sociedade Brasileira de Geologia, Sao Paulo). 1986. 12p. (In Portuguese). (CONF-8605294—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703745.

From 12. symposium of geology in northwest; Joao Pessoa, Brazil (1 May 1986).

The potentiality of geochronology when it is applied to the geologic context of craton basement of archean areas is shown. Samples from southern part of the Sao Francisco Craton, in Brazil, were collected for petrographic analysis and geochronological data interpretation. The set of radiometric determinations was obtained by K-Ar, Rb-Sr, Pb-Pb and U-Pb methods. (M.C.K.).

50325 (NAGRA-NTB—83-14) Exploratory borehole Riniken. Working programme. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Aug 1983. 105p. (In German). Nagra, CH-5401 Baden, Switzerland.

An extensive geophysical borehole logging programme will serve to verify the results of the core analysis and comlement the core data. Numerous borehole logs are to be registered with different types of tools. These allow one to determine various parameters essential for the full description of the rock sequences penetrated. A first category of logs enables the petrographical identification of the different rock types and indicates porous zones that are either water- or hydrocarbon-bearing. A second category provides data e.g. on the degree of pore and fracture fill, rock density and rock temperature, natural gamma radiation and rock-mechanical properties. Other logs measure strike and dip of the sedimentary layers and the position of rock fractures. A forth category provides information on the diameter and the deviation of the borehole, the quality of casing cementations and the position of casing joints. In addition, well shooting surveys will supply exact values of seismic velocities for the various rock units; data that are needed for the depth correction of the reflection profiles from Nagra's regional seismic network. With numerous hydrological tests ranging from a production test of the Muschelkalk aquifer to labelled slug tests in low-permeability crystalline sections, the hydraulic conditions of deep groundwater flow will be investigated. The recovered water samples will undergo full physical and geochemical analysis. Furthermore, their isotope content is to be measured in order to estimate the age of the various formation waters and their time of residence in the subsurface. To round off the scientific investigations, a series of rock-mechanical and geotechnical laboratory tests will provide characteristic values to be applied eventually in the design and construction of shafts and caverns for an underground repository.

5802 Geophysics

REFER ALSO TO CITATION(S) 49372, 49425, 49431

50326 (NAGRA-NTB—83-08) Inventory of earthquakes 1910-1982 and map of the magnitude threshold values 1928-1982. Mayer-Rosa, D.; Benz, H.; Kradolfer, U.; Renggli, K. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Jul 1983. 23p. (In German). Nagra, CH-5401 Baden, Switzerland.

The earthquake activity in Switzerland was investigated recently in great detail with special emphasis on the area bordering Germany between Basel and the Lake of Constance. The results are compiled in a chronological earthquake catalogue for the years 1021 to 1982. For the time period 1910-1964 the existing catalogue was updated with mainly smaller events having seismic intensities less than IV. For the time since 1919, during which the availability of instrumental records in Switzerland increased, a majority of the earthquake parameters (such as location, focal depth and Richter-magnitude) could be determined more accurately with the aid of a new computer program. An important aspect of the work lies in the uniform treatment of all data with respect to new velocity-models for the earth's crust. Furthermore, the theoretical sensitivities of the differing seismic station networks which have been put into operation in Switzerland since 1919 were evaluated and mapped in terms of magnitude-thresholds.

50327 (UCRL—15949) The Topopah Spring Tuff: Evidence for dynamic withdrawal from a layered magma body. Schuraytz, B.C.; Vogel, T.A.; Younker, L.W. (Michigan State Univ., East Lansing (USA). Dept. of Geological Sciences; Lawrence Livermore National Lab., CA (USA)). 15 Aug 1987. Contract W-7405-ENG-48. 97p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000050.

The Topopah Spring Tuff is a classic example of a compositionally zoned ash-flow sheet resulting from eruption of a compositionally zoned magma body. Geochemical and petrographic analyses of whole-rock tuff samples indicate that the base of the ash-flow sheet and the dominant volume of erupted material consist of crystal-poor high-silica rhyolite, with a gradational transition into overlying crystal-rich quartz latite. Major and trace element analyses of glassy pumices and microprobe analyses of their oxide and silicate phenocrysts provide closer approximations to the chemical and thermal gradients within the magma body. The gradients inferred from these data indicate that the transition from high-silica rhyolitic to quartz latitic magma was abrupt, rather than gradational, with a distinct liquid-liquid interface separating the contrasting magmas. Observations are consistent with fluid dynamic models in which the angular velocity field developed near the entrance region of the vents results in simultaneous withdrawal of magma from a continually greater lateral and vertical extent within the chamber. The abrupt transition to chemically variable pumices, dominated by those of quartz latitic composition, implies that the interface between the magma layers remained relatively stable until drawdown breached the interface and preferentially erupted higher temperature, more mafic magma along with subordinate amounts of the incompletely exhausted high-silica rhyolitic magma.

50328 (UCRL—15950) Chemical evolution of a magmatic system: The Paintbrush Tuff, SW Nevada volcanic field. Flood, T.P.; Vogel, T.A.; Schuraytz, B.C. (Michigan State Univ., East Lansing (USA). Dept. of Geological Sciences; Lawrence Livermore National Lab., CA (USA)). Sep 1987. Contract W-7405-ENG-48. 74p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000049.

The chemical and thermal evolution of a single magmatic system is recorded in a series of four ash-flow sheets, the Paintbrush Tuff, that were erupted from the same caldera within a span of 600,000 years. The chemistry of individual glassy pumices, collected from the tops and bottoms of the ash-flow sheets, are used to quantitatively evaluate possible fractionation mechanisms, such as magma mixing and fractional crystallization. The glassy pumices are used because they most nearly approximate the magma in the chamber. All of the chemical variation within the Paintbrush Tuff can be accounted for by fractional crystallization or magma mixing

operating alone and/or in conjunction. No other fractionation processes need by invoked. Also, volume estimates based on quantitative modeling reveal that the size of the ash-flow sheets do not reflect the size of their associated reservoirs.

50329 **Model geoid anomalies due to subduction of inextensible lithosphere.** Willemann, R.J.; Anderson, C.A. (Advanced Engineering Technology Group, Los Alamos National Laboratory). *Geophysical Research Letters;* **14**: No. 8, 820-823(Aug 1987).

We compute geoid slopes from models of subduction in which the subducted lithosphere is much stronger than the surrounding mantle. Geoid slope contributions from both the lithospheric slab and mantle boundary deformations are computed from finite element analysis of mantle flow. The finite element model includes a slab of finite length and a depth dependent Newtonian rheology for the surrounding mantle. We find that observed geoid anomalies at subduction zones, which are positive, cannot be matched by models with uniform mantle viscosity. However, even with a strong subducted lithosphere, the ratio of driving load to boundary deformation is significantly increased by a ten-fold increase of viscosity with depth, resulting in a geoid high. We find that the sign of the geoid slopes within 3000 km of the trench are independent of maximum depth of the slab for maximum depths from 700 km to 2800 km. copyright American Geophysical Union 1987

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 50327, 50328

50330 **(DOE/NV/10384—20-Vol.2) Unsaturated flow properties data catalog: Volume 2.** Panian, T.F. (Nevada Univ., Reno (USA). Desert Research Inst.). Jun 1987. Contract AC08-85NV10384. 501p. NTIS, PC A22/MF A01; 1; GPO Dep. File Number DE87012991.

This report presents a catalog of existing unsaturated flow parameter data for various clays, sands, and loams. All quantities are expressed in a constant set of units. 3 refs. (TEM)

50331 **(INIS-BR—846) Sediments of Afonso Bezerra belt-Macaiba (meridional border of Potiguar basin, RN, Brazil).** Mabesoone, J.M.; Damasceno, J.M.; Lima, M. do S.; Oliveira, L.D.D. de; Oliveira, M.I.M. de; Farias, C.C. (Sociedade Brasileira de Geologia, Sao Paulo). 1984. 5p. (In Portuguese). (CONF-8405436—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703741.

From 11. symposium of geology in northwest; Natal, Brazil (1 May 1984).

The mineralogy of sediments from Potiguar basin, Rio Grande do Norte State, Brazil, is investigated and its origin is determined. Usual sedimentologic methods and X-ray diffraction were used. (M.C.K.).

50332 **(INIS-mf—10707) ECONMIG 86. Proceedings. Vol. 2. Submitted papers.** (Stuttgart Univ. (Germany, F.R.). Inst. fuer Grundbau und Bodenmechanik). 1986. 459p. (CONF-8609287—Vol.2). NTIS (US Sales Only), PC A20/MF A01. File Number DE87752889.

From ECONMIG 86: European conference on numerical methods in geomechanics; Stuttgart, F.R. Germany (16 Sep 1986).

This volume 2 of the conference proceedings presents 36 papers discussing models of rock mechanics. Two of these papers are separately analysed for the data bases.

5804 Geochemistry

REFER ALSO TO CITATION(S) 49917

50333 **(INIS-BR—679) Geochemical studies of the sediments of Barreiras group, Itaborai region-RJ, Brazil.** Neves, M.C.G.P. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Quimica). 1983. 135p. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703439.

It is proposed to study the lead, copper, chromium, manganese, vanadium and zinc geochemical bahavior of the clays obtained from outcrop samples of Barreiras group and weathered Pre-Cambriam situated at Itaborai region, in Rio de Janeiro State, Brazil. Field and laboratory description, grain size analyses, X-ray diffraction, emission spectrography, X-ray fluorescence, atomic absorption, transmission electronic microscopy and pH tests were applied to twenty-two samples selected.

50334 **(INIS-BR—824) Use of electron microscopy in the study of hydrocarbon rock-reservoirs.** Mizusaki, A.M.P.; Rehim, H.A.A.A. (Sociedade Brasileira de Microscopia Eletronica, Rio de Janeiro). 1985. 1p. (In Portuguese). (CONF-8509411—4-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703721.

From 10. colloquium of the Brazilian Society of Electron Microscopy; Sao Paulo, Brazil (1 Sep 1985).

Published in summary form only.

50335 **(LA—10945-M) A mineral reconnaissance sampling manual for Costa Rica: Central American energy and resoure project.** Bolivar, S. (Los Alamos National Lab., NM (USA)). Jun 1987. Contract W-7405-ENG-36. 30p. (In English and Spanish). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014997.

This manual describes field procedures for the collection of stream-sediment and rock samples as part of the Mineral Resource Assessment of Costa Rica. It provides guidelines to be followed by personnel collecting, treating, or otherwise handling samples taken as part of this program. The objectives of the manual are to ensure that all samples are collected uniformly and consistent techniques are employed throughout the program. If this is done, the data from this study can be used to identify areas with potential for mineralization. This manual can also be used as a guideline for future geochemical sampling programs in Costa Rica.

50336 **(NUREG/CR—4808) MINTEQ user's manual.** Peterson, S.R.; Hostetler, C.J.; Deutsch, W.J.; Cowan, C.E. (Pacific Northwest Lab., Richland, WA (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Waste Management). Feb 1987. Contract AC06-76RL01830. 156p. (PNL—6106). NTIS, PC A08/MF A01 - GPO. File Number DE87013782.

This manual will aid the user in applying the MINTEQ geochemical computer code to model aqueous solutions and the interactions of aqueous solutions with hypothesized assemblages of solid phases. The manual will provide a basic understanding of how the MINTEQ computer code operates and the important principles that are incorporated into the code and instruct a user of the MINTEQ code on how to create input files to simulate a variety of geochemical problems. Chapters 2 through 8 are for the user who has some experience with or wishes to review the principles important to geochemical computer codes. These chapters include information on the methodology MINTEQ uses to incorporate these principles into the code. Chapters 9 through 11 are for the user who wants to know how to create input data files to model various types of problems. 35 refs., 2 figs., 5 tabs.

64 PHYSICS I

50337 **New directions in physics. The Los Alamos 40th anniversary.** Metropolis, N.; Kerr, D.M.; Rota, G.C. Orlando, FL; Academic Press Inc. (1987). 320p. Academic Press Inc., Orlando, FL 32887.

In 1983 the outstanding scientists gathered in Los Alamos to celebrate the 40th anniversary of the laboratory. This volume contains the papers presented in that meeting. It presents many of the important advances made in physics over the intervening forty years and provides an idea of the possibilities for the future. Among the contributors are eight Nobel Laureates. The contents include: Los Alamos in the 1980s; tiny computers obeying quantum mechanical laws; present, and future of nuclear magnetic resonance; experimental evidence that an asteroid impact led to the extinction of many species 65 million years ago; the lunar laboratory; the future of particle accelerators: Post WWII and now; models, hypotheses

and approximations; comments on three thermonuclear paths for the synthesis of helium; and the sad augurs mock their own passage; experiments on time reversal symmetry and parity; on the course of our magnetic fusion energy enterprise; early days in the Lawrence Laboratory; nuclear charge distribution in fission; developing larger software systems; reflections on style in physics; tuning up the TPC; remarks on the future of particle physics; supernova theory; how well we meant; history and the hierarchy of structure.

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 50131, 50496, 50503, 50713, 50888, 50892, 50920

50338 (BNL—40211) Core bounce supernovae. Cooperstein, J. (Brookhaven National Lab., Upton, NY (USA)). 1987. Contract AC02-76CH00016. 11p. (CONF-870802—20). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014910.

From 194. American Chemical Society national meeting; New Orleans, LA, USA (30 Aug 1987).

The gravitational collapse mechanism for Type II supernovae is considered, concentrating on the direct implosion - core bounce - hydrodynamic explosion picture. We examine the influence of the stiffness of the dense matter equation of state and discuss how the shock wave is formed. Its chances of success are determined by the equation of state, general relativistic effects, neutrino transport, and the size of presupernova iron core. 12 refs., 1 tab.

50339 (CBPF-NF—011/86) Szekeres spacetimes with heat flow. Lima, J.A.S. de. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703353.

A new class of inhomogeneous exact solutions of Einstein field equations is given. They generalize the dust-filled models found by Szekeres. In the course of time a subclass of models present a friedmannian phase.

50340 (CBPF-NF—025/86) New cosmological scenario. Novello, M. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703357.

A resume for an alternative model for the Universe, rather than the Big-Bang, called Eternal Universe, is given. An attempt is made in order to devise solutions for some shortcomings of this model. (L.C.).

50341 (CBPF-NF—027/86) Magnetohydrodynamic cosmologies with a Bertotti-Robinson limit. Portugal, R.; Soares, I.D. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 23p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703359.

A class of cosmological solutions of Einstein-Maxwell equations, which have the Bertotti-Robinson model as an asymptotic configuration is presented. The novel feature of the models is the presence of a conductivity current in Maxwell equations characterizing a regime of magnetohydrodynamics. Exact analytical solutions are exhibited and the solutions may be used as the interior model for the collapse of a self-gravitating bounded fluid with electric conductivity.

50342 (CBPF-NF—030/86) Rotating spacetimes of Goedel-type. Reboucas, M.J.; Teixeira, A.F.F. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703361.

The Goedel-type Riemannian manifolds are examined under two different assumptions on the algebraic structure of the energy-momentum tensor. All Goedel-type manifolds of either Segre type [1,(1,111)] or [(1,11)1] are shown to be spacetime-homogeneous. A generalization of Bampi-Zordan theorem is presented. All Goedel-type Riemannian manifolds of the algebric tachyon fluid type are shown to be conformally flat and isometric to Reboucas-Tiomno model. The conformal form of Reboucas-Tiomno is given.

50343 (CBPF-NF—050/86) General and unified solution for perfect-fluid homogeneous and isotropic cosmological models. Assad, M.J.D.; Lima, A.S. de. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703374.

All perfect fluid spatially homogeneous and isotropic cosmological models (without cosmological constant) are solved in general and unified form when an equation of state p= (γ-1)/sub rho/ is assumed. The explicit dependence of cosmological time on the metrical scale factor is determined for any values of γ and spatial curvature parameter ε. A set of four infinite numerable sequences for values of γ, all of them consistent with the energy conditions and each starting from one the values 0,1/3, 1, 4/3, includes all cases having solutions described by elementary functions. A generation technique yields the construction of all solutions in each sequence. By the use of the conformal time coordinate, the differential equation for the scale factor may be set in the form of that describing the classical motion of a particle subject to a linear force. Closed models are analogous to harmonic oscillators and their 'half periods' are determined as an explicit function of γ, both for the conformal and cosmological times.

50344 (CBPF-NF—056/86) Cosmic-ray nuclear event with an anomalously strong concentration of energy and particles in the central region. Amato, N.M.; Arata, N.; Maldonado, R.H.C. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703376.

A cosmic-ray induced nuclear event detected in the emulsion chamber is described. The event consists of 217 shower cores with $\Sigma E\gamma$ = 1,275 TeV. In log scale, energy and particles are emitted most densely at the small lateral distance corresponding to 0.5 mm; 77 % of the total energy and 61 % of the total multiplicity are inside the radius of 0.65 cm. The shower cores in the central region show exponential-type energy distribution and non-isotropic azimuthal distribution. This event indicates a possibility that phenomena of large transverse momentum could happen to produce a strong concentration of energy and particles in the very forward direction. (Authors).

50345 (LA-UR—87-2977) Particle injection and cosmic ray acceleration at collisionless parallel shocks. Quest, K.B. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 24p. (CONF-8708141—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000507.

From 6. meeting of solar wind; Estes Park, CO, USA (24 Aug 1987).

The structure of collisionless parallel shocks is studied using one-dimensional hybrid simulations, with emphasis on particle injection into the first-order Fermi acceleration process. It is argued that for sufficiently high Mach number shocks, and in the absence of wave turbulence, the fluid firehose marginal stability condition will be exceeded at the interface between the upstream, unshocked, plasma and the heated plasma downstream. As a consequence, nonlinear, low-frequency, electromagnetic waves are generated and act to slow the plasma and provide dissipation for the shock. It is shown that large amplitude waves at the shock ramp scatter a small fraction of the upstream ions back into the upstream medium. These ions, in turn, resonantly generate the electromagnetic waves that are swept back into the shock. As these waves propagate through the shock they are compressed and amplified, allowing them to non-resonantly scatter the bulk of the plasma. Moreover, the compressed waves back-scatter a small fraction of the upstream ions, maintaining the shock structure in a quasi-steady state. The back-scattered ions are accelerated during the wave generation process to 2 to 4 times the ram energy and provide a likely seed population for cosmic rays. 49 refs., 7 figs.

50346 (RRK—86-47) Gauge-invariant perturbations in a spatially flat anisotropic universe. Den, Mitsue. (Hiroshima Univ., Takehara (Japan). Research Inst. for Theoretical Physics). Dec 1986. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703656.

The gauge-invariant perturbations in a spatially flat anisotropic universe with an arbitrary dimension (= N) are studied. In a

previous paper the equations for the perturbations with a wave vector k/sub a/ in one of the axial directions were derived and their solutions were shown. In this paper the perturbations with k/sub a/ in arbitrary directions are treated. The remarkable properties are that all three types (scalar, vector, and tensor) of perturbations are generally coupled, so that a density perturbation can be produced also by vector or tensor perturbations. The formulation is quite general, but the behavior of the perturbations is discussed in a simple case such that N = 4 and k/sub a/ is orthogonal to one of the axial directions. In this case, the perturbations are divided into two groups which are dynamically decoupled from each other. The asymptotic behavior of the perturbations in the group containing the density perturbation is discussed.

50347 **(SLAC-PUB—4409) Cosmology with decaying vacuum energy.** Freese, K.; Adams, F.; Frieman, J.; Mottola, E. (California Univ., Santa Barbara (USA). Inst. for Theoretical Physics; California Univ., Berkeley (USA); Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Sep 1987. Contract AC03-76SF00515. 10p. (CONF-870802—21). NTIS, PC A02. File Number DE88000698.

From 194. American Chemical Society national meeting; New Orleans, LA, USA (30 Aug 1987).

Motivated by recent attempts to solve the cosmological constant problem, we examine the observational consequences of a vacuum energy density which decays in time. For all times later than t ~ 1 sec, the ratio of the vacuum to the total energy density of the universe must be small. Although the vacuum cannot provide the "missing mass" required to close the universe today, its presence earlier in the history of the universe could have important consequences. We discuss restrictions on the vacuum energy arising from primordial nucleosynthesis, the microwave and gamma ray background spectra, and galaxy formation. A small vacuum component at the era of nucleosynthesis, 0.01 < rho/sub vac//rho/sup rad/ < 0.1, increase the number of allowed neutino species to N/sup nu/ > 5, but in some cases would severely distort the microwave spectrum. 9 refs., 3 figs.

50348 **Radiation from kinky, cuspless cosmic loops.** Garfinkle, D.; Vachaspati, T. (Department of Physics, Washington University, St. Louis, Missouri 63130). *Physical Review* [*Section*] *D: Particles and Fields;* **36**: No. 8, 2229-2241(15 Oct 1987).

We discuss a new class of trajectories of loops of cosmic string which are more generic than the ones considered thus far. The gravitational and Goldstone-boson radiation from such loops is calculated and is found to be of the same order of magnitude as radiation due to other loops. If the string is superconducting, the loop emits "fanlike" beams of electromagnetic radiation and the energy emission is strongly anisotropic.

50349 **Vacuum energy of M⁴≧/sup M/≧/sup N/ in even dimensions.** Gleiser, M.; Jetzer, P.; Rubin, M.A. (Theoretical Physics Group, Fermilab, P.O. Box 500, Batavia, Illinois 60510). *Physical Review* [*Section*] *D: Particles and Fields;* **36**: No. 8, 2429-2439(15 Oct 1987).

We obtain an expression for the one-loop effective potential coming from quantum fluctuations of massless scalars and spin-(1/2 fermions in a higher-dimensional manifold of product form M⁴ x S/sup M/ x S/sup N/. In contrast with previous calculations, we consider the case in which the total number of dimensions is even, since this is the relevant case for superstring compactification. A detailed calculation for a ten-dimensional spacetime with two internal three-spheres is performed, and an approximate static solution for the geometry is found, with the two internal radii being of the order of the Planck length for a sufficiently large number of matter fields. We study the stability of this solution and make some remarks on the possible cosmological implications of our results.

50350 **Inhomogeneous cosmology. III. Primordial gravitational waves and dust.** Adams, P.J.; Hellings, R.W.; Zimmerman, R.L. (Los Alamos National Lab., NM; California Institute of Technology, Pasadena; Oregon Univ., Eugene). *Astrophysical Journal;* **318**: 1-14(Jul 1987).

In this paper, the properties of a special class of inhomogeneous cosmological models and the interaction of the inhomogeneities with the evolution of the background geometry and matter are studied. The cosmological model is chosen so that the initial inhomogeneities evolve into plane gravitational waves propagating through a smooth Bianchi I dust background. It is shown how the inhomogeneities interact with matter, 3 K radiation, and the background geometry, causing the expansion to slow down in some regions and speed up in others. It is also shown how the gravitational waves can produce a dragging of the inertial frame which will affect the observed distribution of matter and 3 K radiation. In particular, this frame-dragging effect can account for a major fraction of the obsserved dipole component between the 3 K background radiation and the rest frame of global matter, an effect usually assumed to have been produced by large-scale local motion. 16 references.

50351 **Collapse of 8-10 solar mass stars due to electron capture.** Miyaji, S.; Nomoto, K. (NASA, Marshall Space Flight Center, Huntsville, AL; Brookhaven National Lab., Upton, NY). *Astrophysical Journal;* **318**: 307-315(Jul 1987).

The density at which electron capture can ignite oxygen burning in 8-10 solar mass stars is investigated within the uncertainties of the semiconvection theory. The Ledoux criterion for convection is adopted in order to take into account the maximum effect of heating due to electron capture. It is found that oxygen burning is not ignited by electron captures on Mg-24 and Na-24 at the central density of about 4 x 10 to the 9th g/cu cm, but by capture on Ne-20 at about 1 x 10 to the 10th g/cu cm. This ignition density is 2.5 times lower than in the case with the Schwarzschild criterion, but is still high enough to induce a collapse by electron capture rather than a total explosion of the core. When the oxygen-burning front arrives at M(r) of roughly 0.3 solar mass, the contraction reaches a quasi-dynamic collapse. 26 references.

50352 **Normalization, cold dark matter, and large-scale velocities.** Hoffman, Y. (Los Alamos National Lab., NM). *Astrophysical Journal;* **318**: L7-L10(Jul 1987).

The normalization process used to predict large-scale velocities is examined. In this study, a standard model is assumed, and the quasi-linear evolution of the rms value of density perturbation is calculated. The calculation of the quasi-linear growth of density perturbations using the Zel'dovich (1970) approximation is described. The data reveal that, when the rms value of the density perturbations equals 1, the standard normalization overestimates the normalization constant, the amplitude of the velocity field, and the microwave background anisotropies. The quasi-linear calculations are applied to cold and hot dark matter models. 30 references.

50353 **Effect of neutrino transport on the collapse of iron stellar cores.** Myra, E.S.; Bludman, S.A.; Hoffman, Y.; Lichtenstadt, I.; Sack, N. (Pennsylvania Univ., Philadelphia; Jerusalem Hebrew Univ., Israel). *Astrophysical Journal;* **318**: 744-759(Jul 1987).

A multigroup flux-limited diffusion approximation to neutrino transport, correct to first order in material velocities, is described. The role of neutrino-electron scattering in determining core deleptonization is studied using a modified Fokker-Planck approximation in which adjacent neutrino energy groups are coupled. The moderate deleptonizaton obtained during infall restricts homologous core masses to less than 0.8 solar mass. With 0.6-0.8 solar mass of outer core to traverse, nuclear dissociation alone stalls the shock waves produced at core bounce. In addition, neutrino energy losses remove at least another 4 x 10 to the 51st ergs. In no case is matter ejected promptly as a direct result of the initial shock wave. 60 references.

50354 **Does lower Omega allow a resolution of the large-scale structure problem?.** Silk, J.; Vittorio, N. (California Univ., Berkeley). *Astrophysical Journal;* **317**: 564-575(Jun 1987).

The intermediate angular scale anisotropy of the cosmic microwave background, peculiar velocities, density correlations, and mass fluctuations for both neutrino and baryon-dominated universes with Omega less than one are evaluated. The large coherence length associated with a low-Omega, hot dark matter-dominated universe provides substantial density fluctuations on scales up to

100 Mpc: there is a range of acceptable models that are capable of producing large voids and superclusters of galaxies and the clustering of galaxy clusters, with Omega roughly 0.3, without violating any observational constraint. Low-Omega, cold dark matter-dominated cosmologies are also examined. All of these models may be reconciled with the inflationary requirement of a flat universe by introducing a cosmological constant 1-Omega. 68 references.

50355 **On the quantum mechanics of inflation.** Evans, M.; McCarthy, J. (Rockefeller Univ.). pp 479 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

It is pointed out that the slow-roll equation of New Inflationary Universe Models is not true in general for interacting field theories. In particular, the use of the effective potential is not generally valid. A set of conditions under which it is relevant are determined, but it is argued that they are unlikely to be satisfied by a hot primordial universe.

50356 **Extended structures at intermediate scales in an inflationary cosmology.** Shafi, Q.; Lazarides, G. (Bartol Research Foundation of the Franklin Institute). pp 479 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

In an inflationary cosmology the phase transitions associated with intermediate mass scales may experience a large though not huge number of e-foldings before being finally completed. Extended structures (monopoles, strings, etc.) arising from such transitions are not necessarily inflated away. In an SO(10) model, for example, magnetic monopoles with mass α10/sup 13/-10/sup 14/ GeV can occur at a level which is experimentally detectable. The topologically unstable string-wall system of axion models provides an important source of density fluctuations as a consequence of inflation.

50357 **Inflation with higher dimensional gravity.** Shafi, Q. (Bartol Research Foundation of the Franklin Institute, Univ. of Delaware, Newark, DE 19716). pp 454-455 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

It is suggested that an inflationary phase can be realized in the context of higher dimensional models of gravity.

50358 **Behavior of the inflation-driving scalar field.** Pi, S.Y. (Physics Dept., Boston Univ., Boston, MA). pp 452-453 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

The quantum mechanical behavior of the Higgs field which drives inflation of the early universe is discussed.

50359 **Locally supersymmetric cosmology and the gauge hierarchy.** Ovrut, B.A. (Dept. of Physics, Univ. of Pennsylvania, Philadelphia, PA 19104). pp 447-449 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

The author presents a locally supersymmetric theory that satisfies all the constraints for a successful, new inflationary universe scenario, and has a naturally light gravitino.

6402 Atmospheric Physics

50360 **(PPPL—2456) Theory of magnetospheric hydromagnetic waves excited by energetic ring-current protons.** Chen, Liu; Hasegawa, Akira. (Princeton Univ., NJ (USA). Plasma Physics Lab.; Bell Telephone Labs., Inc., Murray Hill, NJ (USA)). Jun 1987. Contract AC02-76CH03073. 20p. (CONF-8704170—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000118.

From International conference on plasma physics; Kiev, USSR (6 Apr 1987).

A general theoretical formulation, allowing finite ion Larmor radii, general magnetic field geometries and plasma equilibria, has been developed to investigate excitations of magnetohydrodynamic (MHD) Alfven waves within the earth's magnetosphere by the storm-time energetic ring-current protons. In particular, it is found that for adiabatically injected protons, various predicted instability properties are consistent with satellite observations. 8 refs.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 50089, 50504, 50756, 50757, 50921

50361 **(ATOMKI-B—18-1986) Shape analysis of the 'cusp' in the spectrum of electrons ejected into forward direction from ion-atom collisions.** Berenyi, D.; Gulyas, L.; Koever, A.; Szabo, Gy. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). Oct 1986. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703349.

The energy dependence of the parameters in the series expansion of the cusp-shape was studied based on the authors' and all the other published experimental data. The recent theoretical interpretations are also discussed. 35 refs.; 4 figs.; 1 table

50362 **(ATOMKI-B—19(1987)) Simple theoretical approach of multiple ionization and its application for 5.1 and 5.5 MeV/u X/sup q+/ - Ne collisions.** Sulik, B.; Kadar, I.; Ricz, S.; Varga, D.; Vegh, J.; Hock, G.; Berenyi, D. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1987. 24p. (CONF-861114—57). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700107.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

A simple model is suggested to describe the multiple ionization process in ion-atom collision phenomena, interpretation and evaluation of which are very complicated because of the overlapping elementary processes. The simple geometric model of ionization is extended to describe the impact parameter dependence of the ionization probability and to involve the magnetic subshells in the ionization. The predicted universal scaling properties are tested for L and M shell data of collisions of N and H ions with Ne atoms. A good agreement was found in a wide range of the projectile velocity for different projectile and target atoms. The limits of the validity of the model are discussed. (D.Gy.). 36 refs.; 7 figs.

50363 **(CONF-870784—3) Third-harmonic generation and multiphoton ionization spectroscopy.** Fotakis, C.; Stockdale, J.A.D.; Proctor, M.J. (Oak Ridge National Lab., TN (USA); Crete Univ., Iraklion (Greece). Inst. of Electronic Structure and Laser). 1987. Contract AC05-84OR21400. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013545.

From NATO workshop on atomic and molecular processes with short intense laser pulse; Sherbrooke, Canada (19 Jul 1987).

Nonlinear phenomena, such as multiphoton excitation (MPE) processes leading to ionization and third-harmonic generation (THG) in gases have become the issue of extensive studies over recent years. Studies in rare gases in particular have resulted in sev-

eral interesting observations in this respect. Thus, it has been established that three-photon resonantly enhanced multiphoton ionization (MPI) in the vicinity of states which are single photon optically coupled to the ground state may occur in efficient competition with THG. The present work demonstrates several new effects which may appear when third-harmonic radiation is present during MPI.

50364 **(CONF-8708135—1) Storage rings for investigation of ion-atom collisions.** Schuch, R. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 16p. NTIS, PC A02. File Number DE87014950.

From 3. workshop on high energy ion-atom collisions; Debrecen, Hungary (3 Aug 1987).

In this survey, we give a brief description of synchrotron storage rings for heavy ions, and examples for their use in ion-atom collision physics. The compression of the phase space distribution of the ions by electron cooling, and the gain factors of in-ring experiments compared to single-pass experiments are explained. Some examples of a new generation of ion-atom collision experiments which may become feasible with storage rings are given. These include the studies of angular differential single- and double-electron capture cross sections, the production of slow highly charged recoil ions, and atomic collision processes using decelerated and crossed beam. 30 refs.

50365 **(CRN-CPR—86-09) Study of excitation transfer in fluid molecular media: 2. Experimental aspects.** Sipp, B.; Voltz, R. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1986. 33p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE87752807.

The validity of our kinetic theory of excitation transfer between moving donors and acceptors is examined from donor fluorescence decay measurements performed in solutions with various acceptors. The experimental existence of specific fast and slow diffusion regimes has been made conspicuous. Experimentally deduced transfer lengths are discussed as a function of the viscosity of the solvent and of the reactive interaction responsible for excitation transfer. The characteristic parameters of the naphthalene-anthracene exchange interaction-cooperating in conjunction with a long-range dipole-dipole mechanism - could be deduced from transfer rate measurements in solvents of different viscosities.

50366 (INIS-BR—838, pp 19) **Search for 3d σg bound state in H/sup +//sub 2/.** Castro Faria, N.V. de; Pinho, A.G. de; Chevalier, M.; Gaillard, M.J.; Kirsch, R.; Poizat, J.C.; Remillieux, J. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica; Institut de Physique Nucleaire, Lyon, France). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50367 (INIS-BR—838, pp 65) **Comparison of several nuclear reactions used for measuring hydrogen profile in solids.** Livi, R.P.; Fulin, X.; Trombello, T.A.; Rauch, F.; Chengru, S. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica; California Inst. of Tech., Pasadena, USA; Frankfurt Univ., Germany, F.R.; Lanzhou Univ., GS, China). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50368 (INIS-BR—838, pp 22) **Excitation of 2 p electrons of silicon in Si(CH/sub 3/)/sub 4/, Si(CH/sub 3/)/sub 3/ Cl and Si (CH/sub 3/)/sub 2/ Cl/sub 2/ molecules by electron impact.** Souza, G.G.B. de; Lucas, C.A.; Rocco, M.L.M. (Rio de Janeiro Univ., Brazil. Inst. de Quimica; Universidade Federal Fluminense, Niteroi, Brazil. Inst. de Quimica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50369 (INIS-BR—838, pp 25) **Electron excitation of the CO/sub 2/ molecule by electron impact.** Roberty, H.M.B.; Souza, G.G.B. de; Bielschowsky, C.E.; Lucas, C.A. (Rio de Janeiro Univ., Brazil. Observatorio de Valongo; Rio de Janeiro Univ., Brazil. Inst. de Quimica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50370 (INIS-BR—838, pp 28) **Calculations of photoionization cross sections of atoms and molecules, using integrable quadratic bases and correlated wave functions.** Hollauer, E.; Meth, S.; Nascimento, M.A.C. (Rio de Janeiro Univ., Brazil. Inst. de Quimica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50371 (INIS-BR—838, pp 34) **Cross sections of one and two electron losses for H/sup -/ and H/sup 0/ collisions with light noble gases.** Almeida, D.P.; Castro Faria, N.V. de; Freire Junior, F.L.; Montenegro, E.C.; Pinho, A.G. de. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50372 (INIS-BR—838, pp 37) **Formation of H/sup -/ in proton and fast hydrogen atom collisions with noble gases.** Almeida, D.P.; Castro Faria, N.V. de; Freire Junior, F.L.; Montenegro, E.C.; Pinho, A.G. de. (Rio de Janeiro Univ., Brazil. Inst. de Fisica; Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50373 (INIS-BR—838, pp 53) **ANGULO: Monte Carlo computer program for transporting atomic and molecular beams in solid targets.** Coelho, L.F. (Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50374 (INIS-BR—838, pp 56) **Calculations of Auger spectra.** Nascimento, M.A.C. (Rio de Janeiro Univ., Brazil. Inst. de Quimica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50375 (INIS-BR—838, pp 94) **Effects of polarization and binding energy in K-shell ionization by /sup 16/O and /sup 32/S ions.** Sigaud, G.M.; Montenegro, E.C.; Seidel, J.; Dost, M. (Instituto de Radioprotecao e Dosimetria, Rio de Janeiro, Brazil; Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica; Koeln Univ., Germany, F.R. Inst. fuer Kernphysik). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50376 (INIS-BR—838, pp 31) **Production of H/sup -/ beams from hundreds KeV to few MeV region.** Castro Faria, N.V. de; Gaillard, M.J.; Poizat, J.C.; Remillieux, J. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica; Institut de Physique Nucleaire, Lyon, France). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50377 (INIS-mf—10971, pp 149-157) **Possibilities of the ion acceleration by a REB injection into gas.** Khodataev, K.V. (AN SSSR, Moscow. Inst. Radiotekhniki i Ehlektroniki). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

Accelerated ions were observed when relativistic electron beams were transported across a neutral gas. The mechanism of the ion acceleration is not fully known. The paper summarizes the experimental results, the conditions when the ion acceleration occurs and the observed properties of the effect. The proposed theories of ion acceleration mechanism, the successes and failures of the theories are discussed in detail. The most possible explanation is the formation of pseudocathode by the beam. The problem of Cherenkov resonance of a potential solitary wave is discussed. The instability of the flying pseudocathode needs further investigations. (D.Gy.). 13 refs.; 6 figs.

50378 (INIS-mf—10998, pp 32) **Neutron scattering in surfactant systems.** Zemb, T.N. (Australian National Univ., Canberra. Research School of Chemistry). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

50379 (LBL—22750, pp 15-31) **Center for X-Ray Optics.** 15 Apr 1987. NTIS, PC A05/MF A01. File Number DE87013955.

In Accelerator and Fusion Research Division: Summary of activities, 1986.

Involvement with x-ray sources ranged from the design of new wigglers and undulators for synchrotron radiation facilities to theoretical investigations of how coherent radiation emerges from noise in high-gain free-electron lasers. New insertion device designs, for example combine permanent-magnet materials and electromagnets, both to control saturation effects - thus making higher fields possible - and to compensate for field errors. In collaboration with IBM much improved x-ray zone plates were fabricated and tested. This circular diffractive structure has resolving powers of 1000 angstroms. The development of multilayer-coated glancing-incidence mirrors culminated in the achievement of submicrometer resolution at 8 keV. A new design was developed for high-resolution monochromators and spectrometers the soft x-rays.

50380 (PSD—87, pp A3) **New calculation of basic characteristics of electron-positron interaction in metallic systems.** Stachowiak, H.; Rubaszek, A. (Polska Akademia Nauk, Wroclaw. Inst. Niskich Temperatur i Badan Strukturalnych). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50381 (PUC-TN—05/84) **Two-electron one-photon decay rates in doubly ionized atoms.** Baptista, G.B. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703644.

The transion rate for the two-electron one-photon and one-electron one-photon decaying processes in atoms bearing initially two K-shell vacancies were evaluated for Ne up to Zr. The two-electron one-photon decay process is considered to be the result of the interaction between the jumping electrons and their interaction with the radiation field. The calculation is performed in second order perturbation theory and the many particle states are constructed from single particle solutions. The present approach allows one to discuss several aspects of the decaying process. The results obtained for the branching ratio between the two processes reproduces reasonably well available experimental data and show an almost linear dependence on the second power of the atomic number. A comparison with other theoretical predictions is also presented for the two decaying processes and the strong dependence of the branching ratio on the initial configuration of the decaying atom is pointed out.

50382 (PUC-TN—07/84) **K-shell ionisation cross sections for W, Au and U by low velocity protons.** Castro Faria, N.V. de; Freire Junior, F.L.; Montenegro, E.C.; Pinho, A.G. de; Silveira, E.F. da. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703646.

Proton-induced K-shell ionisation cross section for W, Au and U by low velocity protons were obtained from thick target measurements. For the first time the lowest incident energy reached a value less than 10 times the binding energy of the K-shell electron (less than 9 times in the case of Au). Possible errors are thoroughly examined and a comparison with other available experimental results and theoretical values is presented and discussed.

50383 (SAND—87-0644C) **Ro-vibrational laser spectroscopy of ESD neutrals from chemisorbed species.** Burns, A.R.; Stechel, E.B.; Jennison, D.R. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 7p. (CONF-8705194—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013011.

From 3. international workshop on desorption induced by electronic transitions; Shelter Island, NY, USA (20 May 1987).

Ever since the introduction of intense tunable laser radiation, the fields of molecular spectroscopy and dynamics have expanded tremendously. Indeed, with each technical improvement in laser resolution and output power, new applications have emerged with correspondingly increased levels of sophistication and information. In the field of electron-stimulated desorption (ESD), not only has the utilization of lasers resulted in the detection of neutral species, which were previously difficult to observe without specially-designed analyzers, but also the quantum-specific nature of the resonant laser interaction with the neutrals has yielded valuable information concerning internal energies. In this article, we will discuss some of the experimental methods in the application of laser resonance-ionization spectroscopy (RIS) to the study of the ESD of neutrals, in particular, chemisorbed NO and CO desorption from Pt(111). We will also show how the detailed information obtained in these experiments has identified a new desorption mechanism.

50384 (SAND—87-1682C) **Status of cross section data for photon scattering by atoms.** Kissel, L.; Pratt, R.H. (Sandia National Labs., Albuquerque, NM (USA); Pittsburgh Univ., PA (USA). Dept. of Physics and Astronomy). 1987. Contract AC04-76DP00789. 5p. (CONF-871101—13). NTIS, PC A02/MF A01; GPO Dep. File Number DE87011281.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

In this discussion of photon scattering from atoms, we distinguish between elastic and inelastic scattering, and we restrict our attention to the scattering of one photon from an isolated atom. We do not consider the absorption of that photon (atomic photoeffect), or multi-photon processes (as in an intense laser beam), or processes in which additional particles are created (as in photon splitting or creation of electron-positron pairs), or effects of atomic environments (as in solids or plasmas). We also do not consider two-step processes involving substantial time delays, which can be understood in terms of absorption and subsequent re-emission (fluorescence).

50385 (UCRL—96701) Resonances in near-threshold x-ray photoabsorption of inner shells. Del Grande, N.K.; Tirsell, K.G.; Schneider, M.B.; Garrett, R.F.; Kneedler, E.M.; Manson, S.T. (Lawrence Livermore National Lab., CA (USA); Brookhaven National Lab., Upton, NY (USA); Georgia State Univ., Atlanta (USA). Dept. of Physics and Astronomy). 24 Aug 1987. Contract W-7405-ENG-48;AC02-76CH00016. 6p. (CONF-8709135—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000218.

From 14. international conference on X-ray and inner-shell processes; Paris, France (14 Sep 1987).

Synchrotron radiation measurements of near-threshold and broad-range (20 eV - 3 keV) absolute photoabsorption cross sections were made at the Brookhaven National Laboratory (NSLS) and at Stanford (SSRL). Transmission data for well-characterized multilayer foils provided absolute cross sections with 10% overall uncertainties and better than 0.2% energy resolution. Several examples of our results are presented.

50386 IBEX magnetic field extraction and propagation experiments of intense high-energy electron beams. Mazarakis, M.G.; Miller, R.B.; Poukey, J.W.; Adler, R.J. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Applied Physics;* **62**: No. 10, 4024-4035(15 Nov 1987). Contract AC04-76DP00789.

We have investigated the extraction and propagation of intense relativistic electron beams from an immersed foilless diode into a magnetic field-free region. It was established experimentally that under matching conditions, the extracted beam propagates into and through the axially varying magnetic field region with minor perturbation of the equilibrium. The independent variables of the experiment were beam current, beam radius, magnetic field strength, and gas pressure in the field-free region. The accelerator used was IBEX. [J. J. Ramirez, J. P. Corley, and M. G. Mazarakis, in Proceedings of the Fifth International Conference on High-Power Particle Beams, San Francisco (Physics International, San Leandro, CA, 1983), p. 256.] The propagation of the extracted beam was studied up to 60 cm downstream from the extraction foil. A strong, fast growing filamentation instability was observed after extraction. Time-resolved measurements of the beam current, net current, and current distribution were performed by using segmented Faraday cups. Time-integrated measurements of beam rotation and emittance were also recorded.

50387 Vibrationally mediated photodissociation of hydrogen peroxide. Ticich, T.M.; Likar, M.D.; Duebal, H.; Butler, L.J.; Crim, F.F. (Department of Chemistry, University of Wisconsin, Madison, Wisconsin 53706). *Journal of Chemical Physics;* **87**: No. 10, 5820-5829(15 Nov 1987).

Vibrationally mediated photodissociation is a means of studying the spectroscopy of bound vibrational overtone states and of probing the electronic photodissociation dynamics of highly vibrationally excited molecules. In these experiments, a highly vibrationally excited hydrogen peroxide molecule prepared by initial excitation in the region of the third (4ν/sub OH/) or fourth (5ν/sub OH/) overtone of the OH stretching vibration absorbs an additional photon to dissociate to OH fragments whose individual quantum state populations are measured by laser induced fluorescence. This technique is a means of obtaining excitation spectra for bound highly vibrationally excited states and confirms the accuracy of a model that incorporates the role of the torsional vibration in the vibrational overtone spectroscopy. The photodissociation dynamics of highly vibrationally excited molecules are substantially different from those observed for dissociation by single photons of comparable or greater energy. Approximately 11% of the OH fragments formed in the vibrationally mediated photodissociation through 4ν/sub OH/ are vibrationally excited as compared to an unobservable amount ($\leqq$2%) in the single photon ultraviolet dissociation.

50388 Antiresonance in autoionizing Rydberg series of naphthalene. Syage, J.A.; Wessel, J.E. (The Aerospace Corporation, P. O. Box 92957, Los Angeles, California 90009). *Journal of Chemical Physics;* **87**: No. 10, 6207-6209(15 Nov 1987).

Asymmetric Fano line profiles have been observed by autoionization for vibrational Rydberg series of naphthalene. Specific vibrational excitation in the Rydberg series was made possible by two-color excitation that excites the corresponding vibration in the intermediate S_1 level. An observed series of autoionizing states involving the ν/sub 8-bar/ x ν_7 vibration was determined to belong to members n = 11 to 22 of a Rydberg series having a quantum defect of $\delta = 0.10$ and converging to 1537 cm^{-1} above the adiabatic ionization potential. The line shapes were analyzed in terms of degenerate resonance interference between optically active discrete and continua states. Observed linewidths were as narrow as 6 cm^{-1} for naphthalene and 3 cm^{-1} for naphthalene-d_8.

50389 Vibrational relaxation of highly excited SF_6 by Ar. Beck, K.M.; Gordon, R.J. (Department of Chemistry, University of Illinois at Chicago, Chicago, Illinois 60680). *Journal of Chemical Physics;* **87**: No. 10, 5681-5686(15 Nov 1987).

The method of time-resolved optoacoustics was used to measure the time constant tau for the vibrational relaxation of SF_6 by Ar as a function of the average initial excitation $<<E>>_0$. It was found that ptau = 210 +- 30 μs Torr for $<<E>>_0$ between 4000 and 19 000 cm^{-1}, implying nearly pure exponential decay. The average amount of energy change per collision varies linearly with $<<E>>$, having a value of -8 cm^{-1}/collision at 19 000 cm^{-1}. Below 4000 cm^{-1} ptau increases, approaching the low energy value obtained from IR fluorescence measurements.

50390 Product rotational alignment in the excitation transfer reaction $Ar(^3P_2)+N_2 \rightarrow Ar+N_2(C\ ^3Pi/sub\ u/)$. Tyndall, G.W.; de Vries, M.S.; Cobb, C.L.; Martin, R.M. (Department of Chemistry, University of California, Santa Barbara, California 93106). *Journal of Chemical Physics;* **87**: No. 10, 5830-5839(15 Nov 1987).

The velocity dependence of the $N_2(C)$ rotational alignment from the title excitation transfer reaction was studied over the collision energy range 42—460 meV, using a beam-gas time-of-flight method. The alignment was found to be positive, and to increase approximately linearly with energy: the extrapolated line has a large positive intercept, suggesting that the alignment persists down to zero energy. The present results, together with previous studies of this reaction, are consistent with a model in which the reaction occurs preferentially in the plane of rotation of the N_2. It is suggested that this steric effect is due primarily to the orbital overlap requirements of the electron exchange mechanism. The polarization of the fluorescence from the dissociative excitation reactions of Ar^*+CS_2, Ar^*+H_2O, Kr^*+CS_2, and Xe^*+BrCN was also measured and found to be zero at all velocities.

50391 Extended study of the lowest Pi bending vibration—rotation spectrum of Ar—HCl by intracavity far infrared laser/microwave double resonance spectroscopy. Robinson, R.L.; Ray, D.; Gwo, D.; Saykally, R.J. (Department of Chemistry and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **87**: No. 9, 5149-5155(1 Nov 1987). Contract AC03-76SF00098.

The lowest Pi bending state in Ar—HCl has been more completely characterized through the use of far infrared laser/microwave double resonance spectroscopy. This extended analysis includes a partial reassignment of the far infrared spectra of Ar—$H^{35}Cl$ previously reported by Ray et al. and by Marshall et al., as well as an analysis of the ArH/sup 37/ Cl spectra. Improved molecular constants have been determined. The value of the rotational constant is now in good agreement with that calculated by Hutson from the M5 double minimum potential surface. Along with the recently reported spectrum of the Σ bending vibration, this extended analysis provides strong evidence for the existence of two minima character in the intermolecular potential surface of Ar—HCl.

50392 High-resolution far infrared spectrum of a van der Waals stretching vibration: The ν_a band of Ar—HCl. Robinson, R.L.; Gwo, D.; Saykally, R.J. (Department of Chemistry and Materials and Chemical Science Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Journal of Chemical Physics;* **87**: No. 9, 5156-5160(1 Nov 1987). Contract AC03-76SF00098.

The first high-resolution measurement of a van der Waals stretching vibration is reported. The ν_3 fundamental stretching vibration in Ar—HCl has been measured by intracavity far infrared laser/microwave double resonance spectroscopy of a supersonic free jet. Coupling between the stretching state and the nearby bending states gives the spectrum an intensity which is greater than predicted. The molecular constants for the stretching state are in close agreement with calculations by Hutson for the M5 potential surface.

50393 **Hindered rotation and site structure of CD_4 trapped in rare gas solids.** Jones, L.H.; Ekberg, S.A. (Los Alamos National Laboratory, Group INC-4 MS C346, Los Alamos, New Mexico 87545). *Journal of Chemical Physics;* **87**: No. 8, 4368-4370(15 Oct 1987). Contract W-7405-ENG-36.

High resolution infrared absorption spectra have been recorded for the ν_4 vibrational mode of CD_4 trapped in solid argon and krypton. As with CH_4, evidence for two dominant sites was found: one with a cubic close-packed (CCP) environment and the other with a hexagonal close-packed (HCP) environment. The fine structure for the CCP site resembles that for a tetrahedral molecule rotating in an octahedral field: singlet peaks for P(1), Q(1), and R(0), and a doublet for R(1). The fine structure for the HCP site is more complex and is not assigned to specific rotational transitions. By high temperature annealing it was possible to eliminate the HCP site completely with increase in concentration of the more stable CCP site. The slow relaxation of nuclear spin found for CH_4, from an F state (J = 1) to an A state (J = 0), was found to be two orders of magnitude faster for CD_4.

50394 **Photoionization dynamics of excited molecular states: D_2 C ^{1}Pi/sub u/.** Pratt, S.T.; Dehmer, P.M.; Dehmer, J.L. (Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Chemical Physics;* **87**: No. 8, 4423-4428(15 Oct 1987). Contract W-31-109-ENG-38.

The three photon resonant, four photon ionization spectra of D_2 via the C ^{1}Pi/sub u/, v′ = 0—4 levels are reported. The photoelectron spectra for all five bands and the photoelectron angular distribution via the C ^{1}Pi/sub u/, v′ = 0—3←X ^{1}summation$^+$/sub g/, v″ = 0, Q(3) transitions are also reported. The photoelectron spectra are compared with theoretical Franck—Condon factors determined using accurate potential curves for the D_2 C $^1\pi$/sub u/ and D^+_2 X ^{2}summation$^+$/sub g/ states. As in the case of H_2, the photoelectron spectra display non-Franck—Condon behavior, and the photoelectron angular distributions exhibit strong v′ dependences. The relation of the present results to earlier results on H_2 is discussed.

50395 **Dielectronic satellite spectra for hydrogen-like ions.** Nilsen, J. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Atomic Data and Nuclear Data Tables;* **37**: No. 2, 191-233(Sep 1987). Contract W-7405-ENG-48.

The wavelengths, radiative transition rates, satellite intensity factors, and fluorescence yields are presented for dielectronic satellites of nine hydrogen-like ions ranging from Ne^{9+} to Xe/sup 53+/. Dipole transitions from 2l n′l′ → 1s n″l″, where n′,n″ = 2, 3, 4, are included. In this work, relativistic multiconfiguration wave functions are used to calculate energy levels as well as the Auger and radiative transition rates. copyright 1987 Academic Press, Inc.

50396 **Beam current sensor.** Kuchnir, M.; Mills, F.E. (to Dept. of Energy, Washington, DC). US Patent 4,687,987. 18 Aug 1987. Filed date 28 Sep 1984. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A sensor is described for measuring the current of a beam of charged particles, comprising: a. superconducting probe means comprised of a hollow probe having interior and exterior surfaces and surrounding the beam of charged particles, having a continuous slot surrounding the beam of charged particles whereby the interior and exterior surfaces join each other, the slot thereby forming first and second ends of the superconducting probe means such that a current is induced on the exterior surface of the superconducting probe means, the induced current on the exterior surface acting to exclude magnetic flux associated with the beam from interior regions of the probe means in accord with the Meisner effect; and b. superconducting detection means coupled to the probe means and responsive to the current induced therein for providing an output voltage representing the current of the beam of charged particles.

6404 Fluid Physics

REFER ALSO TO CITATION(S) 49896

50397 **(CEA-CONF—8856) Analysis of the specific heat of bcc/sup 3/He in high magnetic field using high-temperature series expansion with a multiple-exchange Hamiltonian.** Suaudeau, E.; Roger, M.; Bernier, M.E. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique du Solide et de Resonance Magnetique). Oct 1986. 14p. (CEA-SPSRM—86-080; CONF-8610184—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752814.

From Conference on quantum fluids and solids; Banff, Canada (13 Oct 1986).

We have extended to order four in β = 1/k/sub B/T the high-temperature series expansion for the bcc phase of solid /sup 3/He with a Hamiltonian including two, three and four-particle exchange. The results are used to analyse recent experimental measurements of the specific heat at low temperature and high magnetic fields.

50398 **(CRN-CPR—86-08) Study of excitation transfer in fluid molecular media: 1. theoretical description.** Sipp, B.; Voltz, R. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1986. 35p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE87752806.

The kinetics of excitation transfer between moving donors and acceptors in fluid solution is studied with a particular emphasis to the respective influence of the diffusive motion of the particules and of the mechanism of the reactive step. Our results show that all the microscopic properties of the transfer interaction (range and intensity) are included in the observable expressions of the transfer kinetics, in contrast to the conclusions of the widely used diffusion-limited reaction theory where the reactive interaction is represented by a more or less absorbing sink of arbitrary radius.

50399 **(DOE/ER/03077—283) On the validation of the Sharp-Wheeler bubble merger model from experimental and computational data.** Glimm, J.; Li, X.L. (New York Univ., NY (USA). Courant Mathematics and Computing Lab.). Sep 1987. Contract AC02-76ER03077. 33p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014806.

The Sharp-Wheeler bubble model of Rayleigh-Taylor instability is studied through numerical computations. By using as input the proper coefficient of the single bubble velocity and the coefficient of the bubble merger criterion, and by setting the initial bubble distribution based on the dispersion relation of linear Rayleigh-Taylor instability, we find a numerical solution for the bubble interface as a function of time. The interface is observed to be in almost constant acceleration with an acceleration coefficient α approximately equal to 0.059. The results are in qualitative agreement at least with the experiment of Read.

50400 **(LA-UR—87-2105-Rev.) The TAB method for numerical calculation of spray droplet breakup.** O'Rourke, P.J.; Amsden, A.A. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 12p. (CONF-871142—1-Rev.). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011756.

From International fuels and lubricants meeting and exposition; Toronto, Canada (2 Nov 1987).

A short history is given of the major milestones in the development of the stochastic particle method for calculating liquid fuel sprays. The most recent advance has been the discovery of the importance of drop breakup in engine sprays. We present a new method, called the TAB method, for calculating drop breakup. Some theoretical properties of the method are derived; its numerical implementation in the computer program KIVA is described;

and comparisons are presented between TAB-method calculations and experiments and calculations using another breakup model.

50401 **(SAND—87-0148C) Theoretical modeling of the fluid mechanics and gas-phase chemistry in a rotating-disk chemical vapor deposition reactor.** Coltrin, M.E.; Kee, R.J.; Evans, G.H.; Miller, J.A. (Sandia National Labs., Albuquerque, NM (USA); Sandia National Labs., Livermore, CA (USA)). 1987. Contract AC04-76DP00789. 9p. (CONF-871027—32). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013471.

From 172. meeting of the Electrochemical Society; Honolulu, HI, USA (18 Oct 1987).

We describe a mathematical model of the coupled fluid mechanics and gas-phase chemical kinetics in a rotating-disk chemical vapor deposition reactor. The analysis uses a similarity transformation that reduces the problem to a one-dimensional boundary value problem. The deposition of silicon from silane is used as an example system. We present predictions of deposition rate as a function of susceptor temperature, spin rate, and carrier gas. 12 refs.

6450 High Energy Physics

REFER ALSO TO CITATION(S) 50993

50402 **(BNL—40222) Brookhaven retrospective.** Alburger, D.E. (Brookhaven National Lab., Upton, NY (USA)). 1987. Contract AC02-76CH00016. 5p. (CONF-870909—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014912.

From Conference on nuclear interactions and structures; Brighton, UK (7 Sep 1987).

Denys Wilkinson's research, seminars, lectures, and other contributions to Brookhaven National Laboratory are reviewed.

50403 **(CONF-870249—10) Supercomputing at FSU.** Levinthal, D.; Goldman, H.; Georgiopoulos, C.; DeKeyser, J.L.; Linn, S.; Youssef, S.; Hodous, M.F. (Florida State Univ., Tallahassee (USA); ETA Systems, Inc., St. Paul, MN (USA)). 1987. Contract FG05-87ER40319;FC05-85ER25000. 21p. (FSU-SCRU—87-08). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013900.

From Computing high energy physics; Pacific Grove, CA, USA (2 Feb 1987).

Over the last several months the experimental physicists at FSU and SCRI have investigated the use of properties of the CYBER-205 on pattern recognition and Monte Carlo calculations. We have found that extremely large performance enhancements can be achieved with such machines if the algorithms are assembled out of intrinsicly vector constructs. This usually requires changes of algorithms. These changes almost always produce codes of a simpler nature emphasizing the rule rather than the exception as is the case in scalar codes. The use of predefined look-up tables allows the exceptions to be handled within the structure of the more common cases making the structure of the algorithm more apparent. This gives speed increases as large as a factor of ten. 2 refs., 5 figs.

50404 **(DOE/ER—0191/4) Programs of the Office of Energy Research: Revision.** (USDOE Office of Energy Research, Washington, DC). Jun 1987. 28p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000689.

In establishing each of the Federal Agencies that have been successively responsible for energy technologies and their development - the Atomic Energy Commission, the Energy Research and Development Administration, and, currently, the US Department of Energy (DOE) - Congress made specific provisions for the conduct of advanced and fundamental research. The purpose of this research has been to support the energy technology development programs by providing insight into fundamental science and associated phenomena and developing new or advanced concepts and techniques. Today, this responsibility rests with the Office of Energy Research (ER), DOE, whose present programs have their origins in pioneering energy-related research of this nature, which was initiated nearly 40 years ago. The Director, Office of Energy Research, also acts as the chief scientist and scientific advisor to the Secretary of Energy for the entire spectrum of energy research and development (R and D) programs of the Department. ER programs include several thousand individual projects and hundreds of laboratories, universities, and other research facilities throughout the Unites States. In the following pages, each of these programs and activities are described briefly for the information of the scientific community and the public at large. 5 figs., 6 tabs.

50405 **(NIKHEF—84) [National Institute of Nuclear Physics and High Energy Physics). Annual report 1984.** (Nationaal Inst. voor Kernfysica en Hoge-Energiefysica (NIKHEF), Amsterdam (Netherlands)). 1985. 112p. NTIS (US Sales Only), PC A06/MF A01. File Number DE87703636.

In this annual report of NIKHEF Amsterdam (Netherlands) research programs of high-energy physics, nuclear physics and radiochemistry are described. Concerning the high-energy physics section (section H) it contains short accounts of experiments carried out at CERN (Geneva) with the Super Proton Synchrotron (WA25, ACCMOR, EHS, CHARM), the proton-antiproton collider (SppS) and LEAR, experiments performed with the DESY (Hamburg) accelerators (Crystal-ball, MARK-J, HERA), the SLAC and LEP experiments and an overview of the activities of the theory group and the technical and instrumentation groups. As for the nuclear physics section (K), short descriptions and (preliminary) results are presented of electron-excitation studies and experiments with pions, muons and antiprotons. Theoretical studies include Coulomb sum rule, quark-bag models, pion-nucleon interaction and the Delta-hole model. A radiochemical and technical part concludes the report. (Auth.). Contains bibliography of 405 refs. of publications prepared by NIKHEF and/or NIKHEF employees or in which they participated; 32 refs.; 37 figs.; 8 tabs.

50406 **(NIKHEF—85) [National Institute of Nuclear Physics and High Energy Physics]. 1985 annual report.** (Nationaal Inst. voor Kernfysica en Hoge-Energiefysica (NIKHEF), Amsterdam (Netherlands)). 1986. 135p. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703637.

In this annual report of NIKHEF Amsterdam (Netherlands) research programs of high-energy physics, nuclear physics and radiochemistry are described. Concerning the high-energy physics section (section H) it contains short accounts of experiments carried out at CERN (Geneva) with the Super Proton Synchrotron (WA25, ACCMOR, EHS, CHARM), the proton-antiproton collider (SppS) and LEAR, experiments performed with the DESY (Hamburg) accelerators (Crystal-ball, MARK-J, HERA), the SLAC and LEP experiments and an overview of the activities of the theory group and the technical and instrumentation groups. As for the nuclear physics section (K), short descriptions and (preliminary) results are presented of electron-excitation studies and experiments with pions, muons and antiprotons. Theoretical studies include Coulomb sum rule, sigma-omega model, pion photoproduction and the (e,e'p) reaction. A radiochemical and technical part concludes the report. (Auth.). Contains bibliography of 416 refs. of publications prepared by NIKHEF and/or NIKHEF employees or in which they participated; 41 refs.; 54 figs.; 6 tabs.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 50475

50407 **(CERN-EP—87-106) Summary of PETRA results on electroweak interactions.** Herten, G. (European Organization for Nuclear Research, Geneva (Switzerland)). 15 Jun 1987. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE88900049.

Results on lepton pair production at PETRA are reviewed with emphasis on tests of the standard electro-weak theory. The forward-backward asymmetry in muon and tau-pair production is established up to $\sqrt{s} \simeq 44$GeV and agrees with the prediction of the GSW-theory. The data are interpreted in terms of sin²nuω' M/ sub z/ and the weak coupling constants. The measurements have

reached a precision such that a detailed treatment of QED and weak radiative corrections is necessary.

50408 (CERN-EP—87-120) Preliminary results on inclusive γ cross sections in anti pp collisions at $\sqrt{s}$ = 24.3 GeV from UA6 experiment. (European Organization for Nuclear Research, Geneva (Switzerland)). 9 Jul 1987. 10p. (CONF-870632—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE88900031.

From International Europhysics conference on high energy physics; Uppsala, Sweden (25 Jun 1987).

Preliminary results on invariant cross sections for inclusive γ production in anti pp collisions at $\sqrt{s}$ = 24.3 GeV and for a transverse momentum domain ranging from 3 to 7 GeV/c (or x/sub T/ from .25 to .57) are presented and compared to recent theoretical predictions based on second order QCD calculations. Our results agree with a model in which a soft gluon distribution in the proton is used. Inclusive π^0 cross sections and eta/π^0 ratios have also been measured.

50409 (LBL—23921) Production of strange particles in hadronization processes. Hofmann, W. (Lawrence Berkeley Lab., CA (USA)). Aug 1987. Contract AC03-76SF00098. 36p. (CONF-8706212—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000461.

From International symposium on strangeness in hadronic matter; Bad Honnef, F.R. Germany (1 Jun 1987).

Strange particles provide an important tool for the study of the color confinement mechanisms involved in hadronization processes. We review data on inclusive strange-particle production and on correlations between strange particles in high-energy reactions, and discuss phenomenological models for parton fragmentation. 58 refs., 24 figs.

50410 (NBI-HE—86-43) Direct photon experiments. Boeggild, H. (Niels Bohr Inst., Copenhagen (Denmark)). Nov 1986. 24p. (CONF-860943—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752890.

From 6. international conference on physics in collision; Chicago, IL, USA (3 Sep 1986).

The author reviews the experiments on direct photon production in hadronic collisions. After a description of the experimental methods for the study of such processes he presents some results on differential cross sections and the γ/π/sup 0/ ratio in π/sup -/p, π/sup +/p, pp, and anti pp processes as well as in reactions of π/sup -/, π/sup +/, and p on carbon. (HSI).

50411 (NIKHEF-H—87-2) Wrong helicity events induced by the CERN-SPS wide band muonic (anti)neutrino beam. Eijnhoven, N. van. (Nationaal Inst. voor Kernfysica en Hoge-Energiefysica (NIKHEF), Amsterdam (Netherlands). Sectie H). 22 Jan 1987. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703639.

By means of a study of like- and unlike sign dimuon events, seen in an (anti)neutrino-deuterium experiment (WA25), the wrong helicity beam backgrounds for the CERN-SPS wide band ν/sub μ/ and anti ν/sub μ/ beams are determined. Also an estimate is given for the contamination of fake muon events in the charged current event sample, due to the decay of charged hadrons in flight and incorrect muon identification by the External Muon Identifier (EMI) and Internal Picket Fence (IPF) systems. (Auth.). 5 refs.; 4 tabs.

50412 (PITHA—87-10) Heavy flavour production and the evidence for B - anti B mixing in the UA1 experiment. Eggert, K.; Moser, H.G. (Technische Hochschule Aachen (Germany, F.R.). 3. Physikalisches Inst.). Jun 1987. 24p. (CONF-870278—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE88900061.

From 4. family of quarks and leptons international symposium; Santa Monica, CA, USA (26 Feb 1987).

The heavy flavour production at the CERN proton-antiproton collider ($\sqrt{s}$ = 630 GeV) is discussed. The heavy quarks are tagged in UA1 via their semileptonic decays into muons. The production cross-section for beauty particles and the topology of the events are in good agreement with QCD calculations, once higher processes, like flavour excitation and gluon splitting, are taken into account. The large amount of like sign dimuons is interpreted as evidence for beauty oscillations. These data are discussed in detail and compared with similar measurements at e^+e^- colliders. 26 refs., 18 figs.

50413 (SLAC-PUB—4372) Limits on rare D-meson decays. Grab, C. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Jul 1987. Contract AC03-76SF00515. 5p. (CONF-870632—7). NTIS, PC A02. File Number DE88000699.

From International Europhysics conference on high energy physics; Uppsala, Sweden (25 Jun 1987).

The latest results from a number of experiments on searches for rare decays of the charmed D-mesons are summarized. This talk reports on upper limits on flavor changing weak neutral current reactions and on processes that do not conserve the lepton family number.

50414 Measurement of the polarization of tau leptons produced in e^+e^- annihilation at $\sqrt{s}$ = 29 GeV. Ford, W.T.; Qi, N.; Read A.L. Jr.; Smith, J.G.; Camporesi, T.; De Sangro, R.; Peruzzi, I.; Piccolo, M.; Hurst, R.B.; Pyrlik, J.; and others. (Department of Physics, University of Colorado, Boulder, Colorado 80309). *Physical Review [Section] D: Particles and Fields;* **36**: No. 7, 1971-1982(1 Oct 1987).

We present measurements of forward-backward energy asymmetries of tau-lepton decay products from the reaction e^+e^-→tau$^+$tau$^-$ in data collected with the MAC detector operating at the SLAC storage ring PEP at a center-of-mass energy of 29 GeV. The energy asymmetries for the decays tau→ν/sub tau/enu-bar/sub e/, tau→ν/sub tau/μnu-bar/sub μ/, tau→ν/sub tau/π, and tau→ν/sub tau/rho are interpreted as effects caused by the combination of maximally parity-violating weak tau decays and a longitudinal polarization produced by the interference of electromagnetic and weak processes. From the forward-backward polarization asymmetry A/sub P/ = (0.06 +- 0.07) x (1 +- 0.011), we determine the coupling-constant product g/sub a//sup e/g/sub v//sup tau/ = (0.26 +- 0.31) x (1 +- 0.011). Assuming g/sub a//sup e/ = -(1/2 as expected, we find g/sup tau//sub v/ = (-0.52 +- 0.62) x (1 +- 0.011), consistent with the prediction of the Glashow-Weinberg-Salam model of electroweak interactions. Alternatively, assuming the standard-model prediction of negligible polarization in tau-pair production, the leptonic energy spectra are used to measure the Michel parameter to be 0.79 +- 0.10 +- 0.10, consistent with the V-A hypothesis for the taunu-bar/sub tau/-W vertex.

50415 Upper limit on B(tau→eta$\pi\nu$). Coffman, D.; Dubois, G.; Eigen, G.; Hauser, J.; Hitlin, D.G.; Matthews, C.G.; Richman, J.D.; Wisniewski, W.J.; Zhu, Y.; Dorfan, D.E.; and others. (California Institute of Technology, Pasadena, California 91125). *Physical Review [Section] D: Particles and Fields;* **36**: No. 7, 2185-2187(1 Oct 1987).

Motivated by recent evidence for the decay tau→eta$\pi\nu$, a search for this decay has been carried out in e^+e^- annihilation at $\sqrt{s}$ = 3.77 GeV. No evidence for decay is found; an upper limit of 2.5% at the 90% confidence level is set on the branching fraction B(tau→eta$\pi\nu$).

50416 Polarization phenomena in high-energy physics. Chamberlain, O. (Lawrence Berkeley Laboratory and Department of Physics, University of California, Berkeley). *AIP (American Institute of Physics) Conference Proceedings;* **145**: No. 1, 26-36(20 Jul 1986). (CONF-8504161—). Contract AC03-76SF00098.

From Workshop on polarized antiproton sources; Bodega Bay, CA, USA (18 Apr 1985).

A short review of polarization phenomena in proton—proton scattering and in hyperon production is presented. The experimental data from pp scattering above 10 GeV and hyperon production from 400 GeV protons incident on a beryllium target are used to illustrate the polarization physics.

50417 **Radiative decays of the J/psi.** Willutzki, H.J. (University of Washington, Seattle, WA 98195). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 14-26(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

Spin parity measurements for the iota(1440) and $\theta(1700)$ confirm previous experiments. The $\pi^+\pi^-$-mode of the $\theta(1700)$ is observed with a sizeable branching ratio. The helicity amplitudes for the $\theta(1700)$ appear to be different from the f'(1515). Two broad states are observed near the iota(1440) mass in the $\gamma\gamma\pi^+\pi^-$ final state and near the h(2030) in the $\gamma\pi^+\pi^-$ final state.

50418 **Production of $Q^2Q\text{-bar}^2$ mesoniums in $\gamma\gamma$ reactions, hardonic collisions, and J/psi radiative decays.** Liu, K.F. (Department of Physics & Astronomy, University of Kentucky, Lexington, Kentucky 40506). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 272-276(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The $rho^0 rho^0$ enhancement and the $rho^+ rho^-$ supression in $\gamma\gamma$ reactions near the threshold is taken as a strong evidence for an exotic isotensor quantum number which signals for the multi-quark ($Q^2Q\text{-bar}^2$) structure. The mass and the cross sections agree well with the prediction based on the $Q^2Q\text{-bar}^2$ structure. The 2^{++} phiphi resonance at 2.16 GeV in πp and pp collisions has been interpreted as a 2^{++} $s^2s\text{-bar}^2$ mesonium. The calculated mass, width, and the cross sections are all in accord with the experimental data. The correlated J/psi pair produced around 7 GeV in πN collisions at 150 and 280 GeV/c has been considered as a 2^{++} $c^2c\text{-bar}^2$ mesonium. The calculated cross sections and the longitudinal and transverse momentum distributions are consistent with the data. The calculated branching ratio for J/psi $\rightarrow \gamma(Q^2Q\text{-bar}^2)$ $2^{++} \rightarrow \gamma$ $rho^- rho^0$ is compatible with the recent experimental upper limit and the ratios of the helicity amplitudes are distinct from the ones measured in J/psi $\rightarrow \gamma$ $\theta(1700) \rightarrow \gamma$ etaeta, γ KK-bar. The branching ratio for J/$\gamma \rightarrow \gamma(s^2s\text{-bar}^2)$ $2^{++} \rightarrow \gamma$ phiphi is predicted to be -10^{-6}.

50419 **Spectroscopy of the Y(2S) with the Crystal Ball.** Irion, J.; (representing the Crystal Ball Collaboration). (Physics Department, Harvard University, Cambridge, Massachusetts 02138; and Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 351-367(30 Jun 1985). (CONF-8504133—). Contract AC03-76SF00515;AC02-76ER03064.

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The Crystal Ball experiment has been taking data at the DORIS II storage ring at DESY/Hamburg on the Y(2S) and Y(1S) resonances since Summer 1982. Results on the hadronic transitions between the Y(2S) and the Y(1S) are presented as well as measurements of the radiative decays of the Y(2S) to the chib states in inclusive and exclusive channels. The exclusive Y(2S) $\rightarrow$ γchi/sub b/ $\rightarrow \gamma\gamma$Y(1S) $\rightarrow \gamma l^+l^-$ sample allows a study of the spins of the chi/sub b/ states. Also discussed is the present status of the zeta(8.3) in the radiative decays of the Y(1S).

50420 **Semileptonic decays of D mesons: Inclusive and exclusive measurements.** Coffman, D.M.; representing the MARKI collaboration. (California Institute of Technology, Pasadena, CA 91125). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 322-331(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

New measurements are presented of the semileptonic decays of charmed D mesons, from data collected at the psi(3770) in the MARKIII detector at SPEAR. Inclusive measurements of the individual D^+ and D^0 semileptonic branching ratios indicate that the D^+ lifetime is substantially longer than that of the D^0. Exclusive measurements yield the branching ratios for the processes D $\rightarrow$ K e ν/sub e/, and D $\rightarrow$ K π e ν/sub e/. A fit is performed to the vector form factor in the decay $D^0 \rightarrow K^- e^+ \nu$/sub e/.

50421 **Search for narrow structure in proton-antiproton annihilation cross sections from 1900 to 1960 MeV.** Lowenstein, D.I.; Pealsee, D.C.; Miller, R.J.; Lewis, R.A.; Oh, B.Y.; Smith, G.A.; Whitmore, J.; Brando, T.; Daftari, I.; de-Guzman, A.; and others. (Brookhaven National Laboratory, Upton, NY). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 137-143(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The p-barp annihilation cross section has been measured with good resolution (—2 MeV rms) in the mass range 1900—1960 MeV. No narrow structures are seen, the 90% confidence level upper limit being 8—12 mb-MeV for the integrated area of a resonance in this mass range. However, we do not rule out a very narrow bump-dip structure seen in an earlier experiment in the 1935—1941 MeV mass interval. The data also do not support the existence of a broad structure previously reported at 1937 MeV.

50422 **Search for resonance structures in inclusive charged pion spectra from p-barp annihilation at rest.** Angelopoulos, A.; Apostolakis, A.; Papaelias, P.; Rozaki, H.; Sakelliou, L.; Spyropoulou-Stassinaki, M.; Fero, M.; Gee, M.Y.; Mandelkern, M.; Ray, R.; and others. (University of Athens, Athens, Greece). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 144-149(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The charged pion momentum spectra from p-barp annihilation at rest have been measured with high statistics. A search for structures finds four narrow lines which are identified with the absorption and decay processes of kaons stopping in the target. Limits of 1-6 x 10^{-4}/p-bar (90% C.L.) are placed on the yield of a narrow state in the mass range 1000—1660 MeV.

50423 **Search for new strange resonances in inclusive charged kaon spectra from p-barp annihilation at rest.** Angelopoulos, A.; Apostolakis, A.; Papaelias, P.; Rozaki, H.; Sakelliou, L.; Spyropoulou-Stassinaki, M.; Fero, M.; Gee, M.Y.; Mandelkern, M.; Ray, R.; and others. (University of Athens, Athens, Greece). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 150-154(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

Charged spectra from p-barp annihilations at rest have been measured using the PS183 spectrometer at LEAR. From these data, charged kaon spectra are produced using time-of-flight separation. The spectra show structures corresponding to annihilation into the K/sup +- /K^-/sub +/ and K*/sup +- /K^-/sub +/ channels. A search for structures indicating other resonances is discussed.

50424 **Etaeta and etaeta' pairs produced at GAMS.** Peigneux, J.P. (LAPP). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 172-185(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

Production of eta meson pairs from pi-minus-proton scattering with 38 GeV/c, 100 GeV/c, and 230 GeV/c pions has been used to look for bound states of gluons. The eta meson pairs were detected via radiative decay.

50425 **Nonperturbative open hadron channels in hadron-spectrum dynamics.** Balazs, L.A.P. (Physics Dept., Purdue University, W. Lafayette, IN 47907). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 237-241(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

In most dynamical hadron-spectrum calculations, the effects of quark loops (and therefore of open hadronic channels like $\pi\omega$, rhorho...) are either ignored altogether or are taken into account in a perturbative or semi-perturbative fashion. On the other hand, there is increasing evidence that such effect may be quite signifi-

cant, particularly in the long-range part of the confinement region. We have therefore embarked on a program in which open hadronic channel (along with the usual closed qq-bar, qqq,... channels) are taken into account non-perturbatively from the beginning. This, when combined e. g. with the usual quenched-loop approximation to lattice QCD, should lead to a more realistic relation between physical Regge slopes and the basic scale of QCD, for example. Preliminary results so far are very encouraging.

50426 **Is the ccc a new deal for baryon spectroscopy?.** Bjorken. (Fermi National Accelerator Laboratory, Batavia, IL 60510). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 390-403(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The possibility of experimental observation of the triply charmed ccc baryon Ω/sub ccc/$^{++}$ is explored. The conclusion is that it is very difficult, but not unthinkable.

50427 **New approach to data acquisition and analysis and its effect on hadron spectroscopy.** Church, M.; Gottschalk, E.; Hylton, R.; Knapp, B.; Sippach, W.; Stern, B.; Christian, D.; Guttierez, G.; Holmes, S.; Wehmann, A.; and others. (Columbia University, New York, NY 10027). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 425-434(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The status and progress of experiments BNL E766 and Fermilab FNAL E690 are presented. This program which utilizes a system capable of analyzing as many as 10^6 complex events per second may have a significant impact on the future of experimental hadron spectroscopy.

50428 **Separated K^- beams (10 GeV and above).** Bunce, G.M. (Associated Universities, Inc., Brookhaven National Laboratory, Upton, New York 11973). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 445-448(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

A short review of the physics and beam dynamics of and proposed accelerator facilities for kaon-minus beams is given.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 50409, 50426, 50500, 50501, 50501, 50590, 50630, 50632, 50633, 50634, 50678, 50679, 50848

50429 **(BNL—40217) Single leptons from heavy quark production.** Dawson, S.; Godfrey, S. (Brookhaven National Lab., Upton, NY (USA)). Aug 1987. Contract AC02-76CH00016. 9p. (CONF-870739—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014917.

From Workshop on experiments, detectors, and experimental areas for the supercollider; Berkeley, CA, USA (7 Jul 1987).

We consider the single lepton decay mode of heavy quarks as a signature of heavy quark pair production at the SSC. We find that events with multijets (n/sub jet/ ≧ 3) and a single high p/sub T/ lepton are a good signal for heavy quark production.

50430 **(CBPF-NF—034/86) Covariant wave equation in the quantum geometry of bosonic strings.** Botelho, L.C.L. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703363.

A covariant wave equation in the Polyakov's Quantum Geometry of Bosonic Strings is proposed. Its main features are the explicit appearance of a metric dependent term (vanishing at D=26) due to the conformal anomaly and its reduction to the Nambu String Wave Equation for D=26, where D is the space-time dimensionality.

50431 **(CBPF-NF—048/86) Consistency question in the renormalization group analysis of deep inelastic scattering.** Dias, S.A.; Mignaco, J.A. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703372.

The application of renormalization group methods in perturbation theory results in a definite behavior for terms of higher orders under changes of renormalization prescription. Apparently, this fails to be true for the one-loop correction to the moments of the non-singlet structure functions, which is believed to be a renormalization group invariant. A possible explanation for this contradiction in the treatment of the terms taking into account non-pertubative effects is pointed. (Authors).

50432 **(CEA-CONF—8832) Can we control the proliferation of nucleon models.** Ripka, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique). Sep 1986. 8p. (CONF-8609163—13). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752810.

From International conference and symposia on unified concepts of many-body problems; Stony Brook, NY, USA (4 Sep 1986).

It is argued that, among the wide variety of nucleon models, several (including skyrmions) have common features which have nothing to do with QCD but which simply involve quarks interacting with the elementary excitations of the physical vacuum.

50433 **(CEA-CONF—8841) Continuum symmetry restoration in lattice models with staggered fermions.** Morel, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique). Sep 1986. 13p. (CEA-SPhT—86-167; CONF-8609142—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752812.

From Lattice gauge theory meeting; Upton, NY, USA (15 Sep 1986).

This talk is a report on results obtained by T. Jolicoeur, R. Lacaze, B. Petersson and the author: staggered fermions can be consistently interpreted as flavoured quarks in the continuum limit of asymptotically free theories on the lattice. This statement is supported by analytical results for the Gross-Neveu model at large N and for a QCD two point function, and by a numerical simulation of SU(2) quenched QCD.

50434 **(IFUSP-P—550) New values for neutrino mass in the context of a horizontal model.** Goldman, C.; Escobar, C.O. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Oct 1985. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703413.

An extended version of the Glashow-Salam-Weinberg model for the electroweak interactions is studied in detail. It has an extra global horizontal symmetry, wich allows the appearance of neutrino mass terms. The constraints imposed by the standard cosmological model are used to determine the allowed range of variation of the free parameters of this model. It is found that unstable massive neutrinos are permited in a set of values for their masses between 100 eV and - 1 GeV.

50435 **(IFUSP-P—588) Spinorial character of the gentilionic baryon states.** Cattani, M.S.D.; Fernandes, N.C. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Jun 1986. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703429.

It is shown that the wavefunction, in an internal colour space of three quarks taken as gentileons, has a bi-spinorial character. In this context, the formalism differs drastically from parastatistics and fermionic theories of quarks. As a direct consequence of the spinorial character the SU(3)/sub colour/ representation can naturally be incorporated into the S/sup 3/ gentilionic symmetry and a selection rule for quark confinement is deduced. Comparing the results with Dirac's bi-spinorial formulation and with Prentki-d'Espagnat theory, striking resemblances are found.

50436 (INIS-BR—688, pp 198) **Unified treatment of the proton and antiproton scattering in nuclei.** Carlson, B.V.; Isidoro Filho, M. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50437 (INIS-BR—746, pp 45-88) **Possibles leptons and quarks with 3/2 spin.** Lopes, J.L. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The possibility of excited lepton and quark existence with 3/2 spin, which would be an indication of having structure in such particles, is examined. A theoretical introduction on 3/2 spin fields and applications is given. (L.C.).

50438 (INIS-BR—746, pp 227-239) **Influences of anomalous magnetic moment and weak interactions on catalytic baryon decay.** Chanda, R.; Mello, E.R.B. de. (Rio de Janeiro Univ., Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

It is shown that the Rubakov-Callan Cross-section for catalytic baryon decay is reduced if an anomalous magnetic moment for quarks is included and the weak interaction effects are also incorporated. The influence of anomalous magnetic moment appears to be far more important than that of weak interaction.

50439 (INIS-BR—746, pp 240-255) **Heavy quark excitation by neutrinos.** Canal, C.A.G.; Santangelo, E.M.; Ducati, M.B.deL.G. (La Plata Univ. Nacional, Argentina; Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

An estimation of the b and c quark production rates is presented in neutrino (antineutrino) nucleon deep-inelastic scattering interactions. The results show clearly the mixture parameter influence of the left-coupling six quark standard model. Mass correction effects are introduced through the re-scaling and the results are compared for three different quark parametrization. (L.C.).

50440 (INIS-BR—746, pp 12-28) **Chiral bag models.** Sa Borges, J. de. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

SU(2) x SU(2) chiral symmetry is presented, its linear and nonlinear realizations are analysed and chiral invariants are constructed. The lagrangian formulation of the MIT bag model exhibiting the violation of chiral symmetry, motivating the introduction of hybrid models where pion and sigma fields are included as in the linear sigma model is studied. (L.C.).

50441 (INIS-BR—746, pp 89-107) **Low energy nucleon-anti-nucleon physics.** Thome Filho, Z.D.; Robillota, M.R. (Rio de Janeiro Univ., Brazil. Coordenacao dos Programas de Pos-graduacao de Engenharia; Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

A discussion of the low-energy nucleon-anti-nucleon interactions, including elastic scattering, bound states and annihilation processes is presented.

50442 (INIS-BR—746, pp 159-165) **Interaction and polarization observables in PId scattering.** Andrade, S.C.B. de; Ferreira, E.M.; Dosch, H.G. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica; Heidelberg Univ., Germany, F.R. Inst. fuer Theoretische Physik). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The contributions of the ΔN interaction in the intermediate state of PId elastic scattering are evaluated, and it is shown that these contributions improve the theoretical description of PId polarization observables.

50443 (INIS-BR—746, pp 180-196) **Hadron spectroscopy: light and heavy mesons.** Carvalho, H.F. de; Castro, A.S. de; D'Oliveira, A.B. (Rio de Janeiro Univ., Brazil. Inst. de Fisica; UNESP, Guaratingueta, Brazil. Faculdade de Engenharia). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The spectrum of masses of light and heavy mesons is calculated, using a potential that shows confinement and asymptotic freedom for quark antiquark pairs. From the analysis of the results the masses of mesons with beauty not yet found experimentally are estimated. The behaviour of the confinement potential under Lorentz transformation is discussed and the spin dependent corrections is calculated. The electromagnetic decay rates and the leptonic and hadronic decay widths for some mesons are also calculated.

50444 (INIS-BR—746, pp 197-205) **Charmonium mass spectrum: influence of the tensor force.** Shokranian, Z.M.O.; Portilho, O. (Brasilia Univ., Brazil. Dept. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The influence of the tensor component of the potential in the charmonium mass spectra is studied. (L.C.).

50445 (INIS-BR—746, pp 218) **Effective range expansion and the pion-pion scattering lenghts.** Adhikari, S.K.; Torreao, J.R.A. (Pernambuco Univ., Recife, Brazil. Dept. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

50446 (INIS-BR—746, pp 256) **Baryonium production with J/sup P/ = 1/sup -/ in the pp/sup -/ -> PI/sup +/X/sup +/ reaction.** Barroso, M.F. (Rio de Janeiro Univ., Brazil. Inst. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

50447 (INIS-BR—746, pp 326-332) **Short range repulsion for baryon interactions in a simplified relativistic approach.** Herscovitz, V.E.; Teodoro, M.R.; Dillig, M. (Rio Grande do Sul Univ., Porto Alegre, Brazil; Erlangen-Nuernberg Univ., Erlangen, Germany, F.R.). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The phenomenologic non-relativistic approach currently adopted to estimate short-range correlations contributions to barionic interactions is extended to the relativistic formulation, in the lack of a detailed relativistic model. Application to σ-hipernuclei is discussed.

50448 (INIS-BR—746, pp 333-345) **Correlations among observables in the neutron-deuteron elastic scattering at low energies.** Frederico, T.; Goldman, I.D. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The /sup 2/S amplitude of the n-d elastic scattering appears like function of the dublet (/sup 2/a) scattering length in the three nucleons calculations. The correlation of Kcotg/sup 2/δ/sub o/ with /sup 2/a, with separable N-N potential calculations, is obtained and the result is independent of the N-N potential. The /sup 2/δ/sub o/ (n-d) values obtained with these lines, using /sup 2/a=.65F (experimental value), agree with p-d data./sup 2/S and /sup 4/S scattering amplitude and tritium energy (E/sub T/) calculations are performed with the zero-range model and an alternative deduction is proposed. These results for the E/sub T/ and Kcotg/sup 2/δ/sub o/ correlation with /sup 2/a show the limitations of this model. (L.C.).

50449 (INIS-BR—746, pp 346) **Nucleon charge and magnetization distributions: implications for the deuteron form factors.** Menezes Franca, H. de. May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

50450 (INIS-BR—746, pp 347-358) **How the inclusion of final state interaction and D-wave effects can improve the description of the pd->ppn reaction.** Alvear, C. (Rio de Janeiro Univ., Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The introduction of a separable potential with tensor term (D-Wave) to describe the low energy neutron-proton final state interaction (FSI) in the break-up reaction pd->ppn improves significantly the agreement with data at 1 GeV on the cross section and asymmetry at high spectator momenta. Strong asymetries in the angle between the proton momentum transfer and the direction of the spectator nucleon are explained in terms of the FSI.

50451 (INIS-BR—746, pp 373-380) **PIN scattering at low energy.** Menezes, A.; Robillota, M.R. (Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The results of the PIN scattering below and imediattely above the threshold are compared. (L.C.).

50452 (INIS-BR—746, pp 108-133) **Center of mass and recoil corrections in Bag Models.** Betz, M. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

Approximate methods of eliminating spurious center-of-mass motion and taking into account relativistic recoil in bag models are reviewed. The soliton bag model is used as a framework to define a relativistic center-of-mass position operator. A procedure to construct moving soliton bags is described. Applications to the calculation of charge radii, magnetic moments and form factors of the nucleon are discussed, with particular attention paid to the MIT-bag limit.

50453 (INIS-BR—746, pp 173-179) **Sum rules, giant resonances and the Quark Model.** Coutinho, F.A.B. (Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

Sum rules and giant resonances are presented in a pedagogical way and the effects due to the inclusion of quarks in such a description are discussed. (L.C.).

50454 (LBL—23575) **Production of heavy squarkonium at the SSC.** Herrero, M.J.; Mendez, A.; Rizzo, T.G. (Lawrence Berkeley Lab., CA (USA); Barcelona Univ. (Spain). Dept. de Fisica Teorica; Texas Univ., Austin (USA). Center for Particle Theory). Jun 1987. Contract AC03-76SF00098. 11p. (CONF-8705163—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000464.

From From colliders to supercolliders workshop; Madison, WI, USA (11 May 1987).

We study the production of heavy bound states of squarks at the SSC and analyze their decays into longitudinal W's and Z's. In some situations a squarkonium state can be detected through its decay into a pair of W's.

50455 (NBI-HE—87-04) **Number of generations related to coupling constants by confusion.** Bennett, D.L.; Picek, I.; Nielsen, H.B. (Niels Bohr Inst., Copenhagen (Denmark); Institut Rudjer Boskovic, Zagreb (Yugoslavia)). Jan 1987. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752893.

In the context of random dynamics, the mechanism of confusion is used to obtain a relation between the number of generations and standard model coupling constants. Preliminary results predict the existence of four generations.

50456 (NBI-HE—87-05) **Anomalous electroweak baryon number non-conservation and GUT mechanism for baryogenesis.** Kuzmin, V.A.; Rubakov, V.A.; Shaposhnikov, M.E. (Niels Bohr Inst., Copenhagen (Denmark); AN SSSR, Moscow. Inst. Yadernykh Issledovanij). Feb 1987. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752892.

We formulate the necessary conditions for the survival of the baryon asymmetry generated in the B-L conserving leptoquark decays. We find that equilibrium anomalous electroweak B-non-conserving interactions do not wash out all the baryon asymmetry if: (I) there is no mixing in the leptonic sector, (II) there is large flavour asymmetry in the leptoquark decays, (III) mass of the Higgs boson is larger than 56 GeV.

50457 (NIKHEF-H—87-4) **Two-photon exclusive meson production at large angles. Contribution.** Brodsky, S.J.; Erne, F.C.; Damgaard, P.H.; Zerwas, P.M. (Nationaal Inst. voor Kernfysica en Hoge-Energiefysica (NIKHEF), Amsterdam (Netherlands). Sectie H). Jan 1987. 13p. (CONF-8609223—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700275.

From ECFA workshop: LEP 200; Aachen, F.R. Germany (29 Sep 1986).

QCD predictions for the production of meson pairs at large angles in $\gamma\gamma$ collisions are summarized, and production rates for LEP200 energies are investigated. (Auth.). 8 refs.; 4 figs.; 1 table.

50458 (SLAC-PUB—4349) **On charm decays: Present status and future goals.** Bigi, I.I. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Jun 1987. Contract AC03-76SF00515. 45p. (CONF-8706185—2). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87013586.

From Charm physics symposium; Beijing, China (4 Jun 1987).

After a qualitative introduction into the dynamics underlying charm decays the author describes in some detail three different theoretical treatments: the Stech et al. description based on factorization, the 1/N approach and an ansatz employing QCD sum rules. The overall agreement of the emerging theoretical picture with the data is rather encouraging and indicates that the effects of hadronization on these decays are under reasonable control. Yet more and more detailed data are needed to confirm (hopefully) this simple picture. The author lists the processes most relevant in this respect

and emphasizes the need for increasing our theoretical sophistication. Once this is achieved we have on one hand acquired the theoretical tools to deal with B physics; on the other hand we will then be ready to exploit charm physics to the fullest in searching for exotic D decays, D^0 - anti D^0 mixing and CP violation.

50459 **Two-loop modular invariance and proper spin-statistics projection for general boundary conditions.** Kikuchi, Y.; Marzban, C. (Institute of Field Physics, Department of Physics and Astronomy, University of North Carolina, Chapel Hill, North Carolina 27514). *Physical Review [Section] D: Particles and Fields;* **36**: No. 8, 2583-2585(15 Oct 1987).

In the fermionic approach of closed-string theories, we study the relationship between the spin-statistics condition imposed at the one-loop level and two-loop modular invariance.

50460 **Signatures of vector-boson compositeness in $e^+e^- \rightarrow \mu^+\mu^-$ for the strongly coupled standard model.** Korpa, C.; Wudka, J. (Center for Theoretical Physics, Laboratory for Nuclear Science dge, Massachusetts 02139). *Physical Review [Section] D: Particles and Fields;* **36**: No. 7, 2157-2160(1 Oct 1987).

We study the cross section and the forward-backward asymmetry of $e^+e^- \rightarrow \mu^+\mu^-$ in the strongly coupled standard model, at energies appropriate for the colliders TRISTAN at KEK, the Stanford Linear Collider, and LEP at CERN (60—180 GeV). Constraints from low-energy measurements are used to calculate the expected deviations from the standard-model results, arising as contributions of excited W and isoscalar vector bosons. The experimental observability, especially at the Z pole, of these deviations is discussed.

50461 **Implications of a precise Z-boson mass determination.** Langacker, P.; Marciano, W.J.; Sirlin, A. (University of Pennsylvania, Philadelphia, Pennsylvania, 19104-6396). *Physical Review [Section] D: Particles and Fields;* **36**: No. 7, 2191-2193(1 Oct 1987).

We show how a precise determination of the Z-boson mass combined with existing neutral-current data will tighly constrain the top-quark mass or imply new physics beyond the standard model.

50462 **Classification and J/sup P//sup G/ selection rules for weak currents.** Berger, E.L.; Lipkin, H.J. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review Letters;* **59**: No. 13, 1394-1396(28 Sep 1987). Contract W-31-109-ENG-38.

Four categories are defined of exotic and nonexotic first-class and second-class weak currents, three of which are suppressed in the standard model. Hadronic final states produced through various symmetry-breaking mechanisms are subject to selection rules which govern their allowed values of J/sup P//sup G/. We show that there are four types of suppressed transitions and give examples of each.

50463 **Electroweak tests of the standard model.** Marciano, W.J.; Parsa, Z. (Brookhaven National Laboratory, Upton, New York 11973). *Annual Review of Nuclear Science;* **36**: No. 1, 171-205(1986). Contract AC02-76CH00016.

Some of the accurate predictions of the standard model are summarized. Included are both charged current and neutral current interactions as well as properties of the Z and W bosons. (AIP)

50464 **Supersymmetric models of particle physics and their phenomenology.** Hinchliffe, I. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Annual Review of Nuclear Science;* **36**: No. 1, 505-543(1986). Contract AC03-76SF00098.

Supersymmetry in the standard model of particle physics is reviewed. Applications include electron-positron annihilation, hadronic reactions, and cosmology. (AIP)

50465 **Search for supersymmetry: Probing physics beyond the standard model.** Haber, H.E.; Kane, G.L. (California Univ., Santa Cruz, USA. Dept. of Physics; Stanford Linear Accelerator Center, CA, USA; Michigan Univ., Ann Arbor, USA. Randall Lab. of Physics). pp 393-584 of Supersymmetry and supergravity. A reprint volume of Physics Reports. Jacob, M. Amsterdam, Netherlands; North-Holland (1986). Contract AC03-76SF00515;AC02-76ER01112.

In this paper we survey methods by which supersymmetry (or other new physics) could be observed in experiments at present and future accelerators. We review some of the motivation for supposing supersymmetry might be a symmetry of nature even though there is presently no evidence for it. We try to systematize the necessary new notation, and discuss in some detail how to calculate results, with considerable emphasis on pedagogical completeness. We summarize present limits on the existence of supersymmetric partners of ordinary particles, and show how to get improved quantitative limits if supersymmetric particles are not detected, so that eventually it is possible to be sure they are either detected or do not exist on the mass scale accessible to experiments.

50466 **Mesons: What can they tell us about glueballs?.** Sinha, R. (University of Rochester, Department of Physics and Astronomy, Rochester, NY 14627). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 79-83(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

I show that the existence of glueballs is necessary as a consequence of the meson mass spectrum, if, one assumes asymptotic freedom and unitarity. From similar arguments, with minimum dependence on specific models, I find limits on the masses of vector and tensor glueballs. I construct a nonorthogonal mixing model which works well for all but the scalar nonet. Within such a mixing model I find the iota unlikely to be a glueball. I expect glueballs to contribute little to the decay rates of mesons, however the meson masses do depend sensitively on glueballs. Also, I expect psi $\rightarrow \gamma +$ glueball decay rate to be small. In view of this, the resonances g/sub T/(2120), g/sub T/(2220) and g/sub T/(2360) can consistently be explained as glueballs.

50467 **Glueball transition amplitudes in SU(2) lattice gauge Monte Carlo calculations.** Liu, K.F. (Department of Physics and Astronomy, University of Kentucky, Lexington, KY 40506). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 90-93(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

The plaquette-plaquette correlation functions are measured in an SU(2) lattice gauge Monte Carlo simulation with 8^4 lattices. The measured 0^{++} and 2^{++} glueball masses agree with the earlier measurements. The vacuum to glueball transition amplitudes are extracted. They are used to estimate the glueball branching ratio in J/psi radiative decays and the results are compared with the existing experimental data.

50468 **Heavy meson decays and pp-bar collisions.** Berger, E.L.; Damgaard, P.H.; Tsokos, K. (Argonne National Laboratory, Argonne, IL 60439). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 257-261(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

We use the formalism of exclusive processes at high momentum transfer, to give predictions for the decay of the 2^{++} chi state into a pp-bar pair and the production cross section for chi in pp-bar collisions.

50469 **Effect of open channels on the mass spectrum of bottomonium.** Lichtenberg, D.B.; Wills, J.G.; Kangas, A.J. (Department of Physics, Indiana University, Bloomington, IN 47405). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 416-420(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

In most quark potential models the level spacing between bottomonium states decreases as the principal quantum number increases. However, in the experimental spectrum of bottomonium the spacing between the 5s and 4s levels is greater than between the 4s and 3s levels. We have calculated the level shifts arising from open channels and found that we can get good agreement with the observed level spacing only if production of a light quark-antiquark pair has an appreciable probability of occurring when the b and b-bar are relatively far apart. This result is consistent with a broken string picture of quark-antiquark pair production.

50470 **Finding a rational nomenclature for mesons and baryons.** Barnett, R.M.; Cahn, R.N.; Gidal, G.; Rittenberg, A.; Trippe, T.G.; Wohl, C.G.; Yost, G.P.; Porter, F.C.; Hernandez, J.J.; Montanet, L.; and others. (Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 474-481(30 Jun 1985). (CONF-8504133—). Contract AC03-76SF00098.

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

A history of the Particle Data Group's efforts to find a rational and systematic convention for naming mesons and baryons is given. Several versions of our proposal are reviewed, and name changes which would occur are summarized. Some of the mail we have received is described. We hope to stimulate additional feedback.

6453 Particle Invariance Principles And Symmetries

REFER ALSO TO CITATION(S) 50462, 50464, 50495, 50498, 50499, 50861, 50862

50471 **(CBPF-NF—012/86) Supergravity.** Srivastava, P.P. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703354.

A comprehensive introduction to the theory of supergravity is given and the super-Higgs effect illustrated by considering several examples of the Kaehler potential occurring in the general coupling to the Yang-Mills system.

50472 **(CRN-HE—86-03) Global symmetries and flat potentials in the compactified superstring.** Li, S.P.; Peschanski, R.; Savoy, C.A. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1986. 13p. (CEA-SPhT—86-079). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752805.

Global symmetries of the D=4 supergravity effective theory consistent with the compactification of the superstring are shown to form an SU(1.1) x U(1) group of transformations acting on the dilaton, axion and matter fields. These are exact invariances of the Kaehler potential if they are preserved by integration over Kaluza-Klein massive states. A key role is played by the cubic superpotential which is also essential in implementing flatness of the scalar potential, a vanishing cosmological constant and thus effective global supersymmetry in the matter sector, at the classical level. This is shown by an explicit computation of the scalar potential. If only an axion-like non-compact subgroup is left unbroken by the superpotential, the cosmological constant turns out to be negative in some cases.

50473 **(PUC-TN—21/84) Convergence of high-intensity expansions for atomic ionization.** Antunes Neto, H.S.; Davidovich, L. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703651.

It is shown that a frequently used nonperturbative approximation for atomic ionization rates is cancelled out when corrections are taken into account. This explains the strong gauge dependence of previous results. A convergent and gauge invariant expansion is obtained. Numerical results show that its first term, which may be calculated analytically in many cases, describes very well the time-dependent behaviour of the ionization probability, for very strong fields.

50474 **(RRK—86-45) Explicit evaluation of covariant one-loop four-point amplitude for open fermionic string.** Yamamoto, Hisashi; Nakazawa, Naohito. (Hiroshima Univ., Takehara (Japan). Research Inst. for Theoretical Physics). Nov 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703654.

We carry out the explicit evaluation of the covariant one-loop amplitude with four massless external bosons for open fermionic string by the operator formalism. The resulting expression of the amplitude completely coincides with that of the light-cone new formalism for type-I superstring theory, providing the explicit demonstration for the one-loop equivalence of the old and new formalisms for the open superstring theory at the four-point interacting level.

50475 **(TRI-PP—87-55) Experimental tests of charge symmetry in the n-p system.** Greeniaus, L.G. (TRIUMF, Vancouver, British Columbia (Canada)). May 1987. 6p. (CONF-870413—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE87900983.

From 11. international conference on particles and nuclei; Kyoto, Japan (20 Apr 1987).

Some experimental and theoretical aspects of charge symmetry breaking in the n-p system are reviewed. Possible experiments involving the $n + p \rightarrow d + \pi^0$ reaction are described and the measurements at TRIUMF and IUCF of the neutron and proton analyzing powers in n-p elastic scattering are discussed. 26 refs., 4 figs.

50476 **Suppression of nonrenormalizable terms in the effective superpotential for (blown-up) orbifold compactification.** Cveti, M. (Stanford Linear Accelerator Center, Stanford University, Stanford, California, 94305). *Physical Review Letters;* **59**: No. 16, 1795-1797(19 Oct 1987). Contract AC03-76SF00515.

We show that all the nonrenormalizable terms in the effective superpotential for any Abelian symmetric orbifold with at least (0,2) world-sheet supersymmetry as well as any blown-up (2,2) orbifold are exponentially suppressed by the size R of the compactified space, i.e., proportionalexp($-R^2/\alpha'$).

50477 **Wilson-loop instantons.** Lee, K.; Holman, R.; Kolb, E.W. (Theoretical Physics Group, Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, Illinois 60510). *Physical Review Letters;* **59**: No. 10, 1069-1071(7 Sep 1987).

Wilson-loop symmetry breaking is considered on a spacetime of the form $M_4 \times K$, where M_4 is a four-dimensional space-time and K is an internal space with nontrivial and finite fundamental group. We show in a simple model that the different vacua obtained by breaking a non-Abelian gauge group by Wilson loops are separated in the space of gauge potentials by a finite-energy barrier. We then construct an interpolating gauge configuration between these vacua and show it to have minimum energy. Finally some implications of this construction are discussed.

50478 **Present status of CP violation.** Wolfenstein, L. (Department of Physics, Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213). *Annual Review of Nuclear Science;* **36**: No. 1, 137-170(1986).

The theoretical explanations of CP violation are reviewed. Among the models considered are the Higgs model, standard model, and Kobayashi-Maskawa model. The hadronic decay of neutral kaons is discussed in great detail. (AIP)

6454 Field Theory

REFER ALSO TO CITATION(S) 50349, 50356, 50459, 50468, 50470, 50477, 50832, 50862

50479 **(CBPF-NF—026/86) Separable orthogonal coordinates and particle creation for an accelarating observer.** Costa, I. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703358.

An exactly solvable example of a non-stationary system, which has an inertial and an uniform accelerated asymptotic region is presented. A set of solutions that are quasi-classical in these two regions is constructed and the two sets are compared. The Bogolinbov-coefficients have the thermal character and show a temperature of a/sub ∞// 2PI, where a/sub ∞/is the asymptotic acceleration in the out-region. This result is much what one would expect on the grounds of the Hawking-effect. It implies that the natural particle number is not conserved in free Minkowski-space.

50480 **(CBPF-NF—037/86) Lagrangian procedures for higher order field equations.** Bollini, C.G.; Giambiagi, J.J. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703365.

We present in a pedagogical way a Lagrangian procedure for the treatment of higher order field equations. We build the energy-momentum tensor and the conserved density current. In particular we discuss the case in which the derivatives appear only in the invariant D'Alembertian operator. We discuss some examples. We quantize the fields and construct the corresponding Hamiltonian which is shown not to be positive definite. We give the rules for the causal propagators.

50481 **(CBPF-NF—044/86) Quantum fermionic string for the three dimensional Ising model.** Botelho, L.C.L. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703369.

It is shown the fermionic string theory which is formally equivalent (on the lattice) to the three dimensional Ising gauge model (3D - I.M).

50482 **(CBPF-NF—045/86) Quantum fermionic string representation for Q.C.D. (SU(Nc)) at Nc=+infinity.** Botelho, L.C.L. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703370.

A covariant fermionic string theory representation for Q.C.D. (SU ∞) in R/sup d/ is studied. It is shwon that the Migdal'Elfin string thepory can be obtained as a particular case from the proposed Q.C.D. (SU ∞) string in the situation of 'smooth' string world-sheet.

50483 **(IFT-P—07/86) On the quantization of the Poincare gauge model.** Aldrovandi, R.; Pereira, J.G. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1986. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703412.

A gauge model based on the Yang-Mills equations for the Poincare group cannot be consistently quantized, at least in a perturbative approach. The problem is related to the absence of a Lagrangian. Adding the counterterms required by consistency and renormalizability turns the model into a gauge theory for a de Sitter group.

50484 **(IFUSP-P—585) Analytic stochastic regularization and gauge invariance.** Abdalla, E.; Gomes, M.; Abdalla, M.C.B.; Lima-Santos, A. (Sao Paulo Univ. (Brazil). Inst. de Fisica). May 1986. 14p. (IFT-P—08/86). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703427.

A proof that analytic stochastic regularization breaks gauge invariance is presented. This is done by an explicit one loop calculation of the vaccum polarization tensor in scalar electrodynamics, which turns out not to be transversal. The counterterm structure, Langevin equations and the construction of composite operators in the general framework of stochastic quantization, are also analysed.

50485 (INIS-BR—688, pp 13) **Feynman-Goldstone diagrams in a time-dependent basis with applications to nuclear collective motion.** Baranger, M. (M.I.T., USA). 1984. NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

An introduction to Feynman-Goldstone diagrams using time dependence perturbation theory is done. An application of theory to nuclear collective motion is done. (L.C.).

50486 (INIS-BR—688, pp 57) **Application of Coulomb and Lorentz gauge conditions for the pertubative treatment of a rotation fermions system.** Bes, D.R. (Comision Nacional de Energia Atomica, Buenos Aires, Argentina. Dept. de Fisica). 1984. (In Spanish). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

The history of the development of quantum field theory for treating coupling between phonons and fermions are summarized. These perturbative theories are applied introducing concept of gauge invariance for the problem of rotation nuclei. (L.C.).

50487 (INIS-BR—746, pp 166-196) **Z(N) models.** Baltar, V.L.V.; Carneiro, G.M.; Pol, M.E.; Zagury, N. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

Lattice field theory is applied for some Z(N) models and phase diagrams are discussed for these models. (L.C.).

50488 **(NBI-HE—86-42) Covariant N-string amplitude.** Di Vecchia, P.; Sciuto, S.; Nakayama, R.; Petersen, J.L.; Sidenius, J.R. (Niels Bohr Inst., Copenhagen (Denmark); Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark); Istituto Nazionale di Fisica Nucleare, Turin (Italy)). Nov 1986. 63p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87752895.

The BRST-invariant N-Reggeon vertex (for the bosonic string) previously given by us in the operator formulation is considered in more detail. In particular we present a direct derivation from the string path integral. Several crucial symmetry properties found a posteriori before, become a priori clearer in this formulation. A number of delicate points related to zero modes, cut off procedures and normal ordering prescriptions are treated in some detail. The old technique of letting the string field acquire a small dimension ϵ/2 -> 0/sup +/ is found especially elegant.

50489 **(NBI-HE—86-46) Scaling behaviour of the effective chiral action and stability of the chiral soliton.** Reinhardt, H. (Niels Bohr Inst., Copenhagen (Denmark); Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Dec 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752898.

The effective chiral action is evaluated within a novel improved heat-kernel expansion, which includes gradients of the chiral field in a non-perturbative way. The exact scaling behaviour of the effective action of a localized chiral field with respect to changing its spatial size is found. From this it is proved that the radiatively induced derivative terms cannot absolutely stabilize the chiral soliton against collapsing. The collapsing of the soliton is, however, accompanied by a vanishing of the baryon charge. It is argued that the effective chiral action constrained to a fixed baryon number may still admit stable soliton configurations.

50490 **(NBI-HE—87-02) Confusion mechanism and the heterotic string.** Bennett, D.L.; Mizrachi, L.; Nielsen, H.B.; Brene, N. (Niels Bohr Inst., Copenhagen (Denmark); Geneva Univ. (Switzerland). Inst. de Physique Theorique). Jan 1987. 22p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752891.

The confusion mechanism introduced earlier in connection with the gauge glass model is here discussed in the context of field theories involving symmetry groups which have outer automorphisms. The heterotic string with an E/sub 8/ x E/sub 8/ symmetry may be influenced by confusion with the result that only one E/sub 8/ group survives and the shadow world disappears.

50491 **(NBI-HE—87-07) Incompatibility of torsion with the Gauss-Bonnet combination in the bosonic string.** Bern, Z.; Shimada, T.; Hochberg, D. (Niels Bohr Inst., Copenhagen (Denmark); Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Jan 1987. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752894.

In general, either manifest unitarity or the inclusion of the antisymmetric tensor field strength as torsion can be trivially implemented via field redefinitions in string theory low energy effective actions. However, requiring both simultaneously is explicitly shown to be incompatible in the bosonic string effective action. We also discuss the usefulness of the redefinition theorem as a technical tool.

50492 **(PUC-TN—19/84) Restrictions on SU(5) as a grand unified theory.** Shellard, R.C. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703649.

Some restrictions imposed upon Grand Unified Theories by dynamical symetry breakdown are examined. They are shown that, in particular, theories SU(5) as symmetry group, with 3 or more fermion families undergo dynamical symmetry breakdown, and some of the fermions will acquire mass at the Grand Unified scale. On the other hand, the SO(10) group, with 3 families is free from this problem.

50493 **(RRK—86-46) Solvable quantum field theories and polynomial conserved quantities for quantum nonlinear Schroedinger equation.** Omote, M.; Sakagami, M.; Sasaki, R.; Yamanaka, I. (Hiroshima Univ., Takehara (Japan). Research Inst. for Theoretical Physics). Nov 1986. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703655.

The quantum version of the infinite set of polynomial conserved quantities for the Nonlinear Schroedinger equation in 1+1 dimensions is discussed. In the conventional formulation of the theory, which describes a quantum many particle system with a delta function potential, it is shown that an infinite set quantum polynomial commuting operators does not exist. However, by adopting a rather unconventional quantization method, we construct an infinite set of quantum polynomial commuting operators explicitly in a parallel way with the KdV and the MKdV equation cases discussed in a previous paper. Based on these results a new scheme of solvable quantum field theories is proposed.

50494 **(SLAC-PUB—4353) Renormalization group improved Yennie-Frautschi-Suura theory for Z^0 physics.** Ward, B.F.L. (Tennessee Univ., Knoxville (USA). Dept. of Physics and Astronomy; Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Jun 1987. Contract AC03-76SF00515. 14p. (CONF-8706198—1). NTIS, PC A02. File Number DE87014609.

From 27. Cracow school of theoretical physics; Zakopane, Poland (3 Jun 1987).

Described is a recently developed renormalization group improved version of the program of Yennie, Frautschi and Suura for the exponentiation of infrared divergences in Abelian gauge theories. Particular attention is paid to the relevance of this renormalization group improved exponentiation to Z^0 physics at the SLC and LEP.

50495 **Two-loop chiral anomalies in open superstrings.** Frampton, P.H.; Kephart, T.W.; Yuan, T. (Institute of Field Physics, Department of Physics and Astronomy, University of North Carolina, Chapel Hill, North Carolina 27514). *Physical Review Letters;* **59**: No. 16, 1802-1804(19 Oct 1987).

We partially analyze the two-loop box and hexagon chiral gauge anomalies in D = 6 and 10 dimensions for super-Yang-Mills theories. We apply these results to the SO(32) open superstring and show that the leading gauge anomaly vanishes at two-loop order while the subleading gauge anomalies, the mixed anomalies, and the subleading chiral gravitational anomalies may all be canceled with appropriate counterterms. To do this in field theory it is necessary to include a term $B(TrF^2)^2$ which is absent at one-loop order in the zero-slope limit of the SO(32) superstring.

50496 **Reflections on moving mirrors.** Carlitz, R.D.; Willey, R.S. (Department of Physics, FM-15, University of Washington, Seattle, Washington 98195). *Physical Review [Section] D: Particles and Fields;* **36**: No. 8, 2327-2335(15 Oct 1987).

A field theory constructed on a space with a moving boundary illustrates many of the physical characteristics of Hawking radiation from black holes. We review this analogy with a number of new refinements. We construct a model in which the Bogoliubov transformation, which is induced by the moving boundary, can be computed explicitly. This model is used to discuss correlations in the final state of the quantum field. This discussion can, in turn, serve as the basis for an investigation into Hawking's proposal that black holes can induce the evolution of quantum-mechanical pure states into mixed states.

50497 **Abelian bosonization in curved space.** E-acute-accentboli, O.J.P. (Center for Theoretical Physics, Laboratory for Nuclear Science dge, Massachusetts 02139). *Physical Review [Section] D: Particles and Fields;* **36**: No. 8, 2408-2410(15 Oct 1987).

We analyze the massive Thirring model and the massive Schwinger model in curved space and show the relationship between these models and the sine-Gordon theory.

50498 **Understanding complex perturbative effective potentials.** Weinberg, E.J.; Wu, A. (Department of Physics, Columbia University, New York, New York 10027). *Physical Review [Section] D: Particles and Fields;* **36**: No. 8, 2474-2480(15 Oct 1987).

We examine the situation where the perturbatively calculated effective potential develops an imaginary part. We show that his imaginary part has a natural interpretation as a decay rate per unit volume of a well-defined state and that it agrees quantitatively with an independent calculation of this rate. We examine in some detail the nature of this decay process.

50499 **Systematic search for anomaly-free theories.** Tosa, Y.; Okubo, S. (Department of Physics, University of Colorado, Campus Box 390, Boulder, Colorado 80309). *Physical Review [Section] D: Particles and Fields;* **36**: No. 8, 2484-2505(15 Oct 1987).

Many new anomaly-free configurations are found group theoretically for space-time dimensions of D = 6,10,14,18. They contain N = 1 supergravitylike constituents, Yang-Mills matter for a simple group, and many Yang-Mills singlets (shadow matter). We also discuss constraints for theories without supergravity, chiral four-dimensional theories, and the absence of global gauge anomalies.

50500 **Perturbative QCD and electromagnetic form factors.** Carlson, C.E.; Gross, F. (Physics Department, College of William and Mary, Williamsburg, Virginia 23185 f&tand Department of Theoretical Physics, University of Lund, S-22362 Lund, Sweden). *Physical Review [Section] D: Particles and Fields;* **36**: No. 7, 2060-2069(1 Oct 1987).

We calculate nucleon magnetic form factors using perturbative QCD for several distribution amplitudes including a general one given in terms of Appell polynomials. We find that the magnitude and sign of both nucleon magnetic form factors can be explained within perturbative QCD. The observed normalization of G/sub M//sub p/ requires that the distribution amplitude be broader than its superhigh-momentum-transfer limit, and the G/sub M//sub n//G/sub Mp/ data may require the distribution amplitude to be asymmetric, in accordance with distribution amplitudes derived from QCD sum rules. Some speculation as to how an asymmetric distribution amplitude can come about is offered. Finally, we show

that the soft contributions corresponding to the particular distribution amplitudes we use need not be bigger than the data.

50501 **Confinement problem.** Cutkosky, R.E. (Physics Department, Carnegie-Mellon University, Pittsburgh, PA 15213). *AIP (American Institute of Physics) Conference Proceedings;* **132**: No. 1, 227-236(30 Jun 1985). (CONF-8504133—).

From International conference on hadron spectroscopy; College Park, MD, USA (20 Apr 1985).

Progress in understanding the structure of quark-gluon composites requires accurate non-perturbative calculations of the quantum fields. A new Hamiltonian method for numerical calculation, which uses a normal-mode expansion in a spatial domain which is essentially of hadron size, is described here. We consider QCD in the Coulomb gauge, and explore the confinement of color via Gribov's scenario, which involves properties of the Faddeev-Popov determinant and of the chromoelectrostatic potential. Simplified calculations support the existence of a mass gap, and provide some suggestions about the properties of confined gluons which may be useful in phenomenological models.

50502 **Monte Carlo calculations in lattice gauge theories.** Bowler, K.C.; Rebbi, C. (Physics Dept., Univ. of Edinburgh, Edinburgh EH9 3JZ, Scotland). pp 409-487 of Statistical and particle physics: Common problems and techniques. Bowler, K.C.; Mc Kane, A.J. Edinburgh, Scotland; SUSSP Publications (1984). (CONF-8308232—).

From 26. Scottish Universities Summer School in physics on statistical and particle physics: common problems and techniques; Edinburgh, UK (1 Aug 1983).

This paper covers the following: a few words of motivation for numerical simulations, and a description of the Monte Carlo method as applied to lattice gauge theories. This is followed by a discussion of systems that contain bosonic degrees of freedom only. The authors review Monte Carlo results for pure gauge systems, illustrating the determination of a variety of observables - the string tension, the potential, the temperature at which quarks become deconfined, and attempts to calculate the mass gap of the theory, also called the glue-ball mass. They try to explain what happens if one considers various types of the action, how one verifies universality in the passage to the continuum limit and we mention briefly simulations applied to systems that go beyond just gauge fields and include other bosonic fields, known in general as Higgs scalars. Finally they consider fermions on the lattice, pointing out conceptual problems in the formulation of the Dirac equation on the lattice, and then discussing the difficulties that arise in attempting to apply the same kind of numerical methods to fermionic systems, the approximations and the techniques that are used to overcome these problems and some of the numerical results.

50503 **Inflation circa 1983.** Turner, M.S. (Enrico Fermi Institute, The Univ. of Chicago, Chicago, IL 60637). pp 228-255 of Proceedings of the fourth workshop on grand unification. Weldon, H.A.; Langacker, P.; Steinhardt, P.J. Cambridge, MA; Birkhauser Boston Inc. (1983). (CONF-8304112—).

From 4. workshop on grand unification; Philadelphia, PA, USA (21 Apr 1983).

The hot big bang cosmology provides a reliable accounting of the evolution of the Universe from — 0.01 s after 'the bang' until the present (10-20 Byr after 'the bang'). This is a truly impressive achievement. There are, however, a handful of very fundamental 'cosmological facts' which the model by itself fails to elucidate. They include: the large-scale homogeneity, the isotropy, the small-scale inhomogeneity, the near critical expansion rate, the predominance of matter, the 'monopole problem', and the extremely tiny value of the present cosmological term. Inflation makes the present state of the observable Universe virtually insensitive to the initial state of the Universe. Unfortunately, at present there is no model of new inflation which both resolves the cosmological puzzles and leads to sensible particle physics. A general prescription for the cosmologically-desirable Higgs potential does exist.

65 PHYSICS II

REFER ALSO TO CITATION(S) 50337, 50404, 50405, 50406

50504 **(KVI—85) KVI annual report 1985.** Jansen, J.F.W.; Wilschut, H.W.E.M. (eds.). (Rijksuniversiteit Groningen (Netherlands). Kernfysisch Versneller Inst.). 1986. 136p. Library KNAW, P.O. Box 19121, 1000 GC Amsterdam.

Refs.; figs.; tabs. .

In this annual report of the Kernfysisch Versneller Instituut (KVI) at Groningen (Netherlands) brief descriptions are presented of current research in the following branches of science: experimental nuclear physics (nuclear structure, giant resonances, light/heavy ion reaction mechanisms, electroweak interactions); theoretical nuclear physics (nuclear structure, many body theory); atomic and surface physics; solid state physics; environmental studies; nuclear medicine; cyclotron, ion sources and instrumentation; the Agor project (Accelerator Groningen Orsay). (Auth.). Contains bibliography of 179 refs. of publications prepared by KVI and/or KVI employees or in which they participated.

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 49617, 50402, 50609, 50673

50505 (IAEA-TECDOC—410, pp 65-76) **Neutron emission in the heavy ion reactions at the energies below 20 MeV/A.** Blinov, M.V.; Kovalenko, S.S.; Kozulin, E.M. (Radievyj Inst., Leningrad, USSR). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The yields, the energy spectra and the angular distributions of neutrons at heavy ions interaction with different nuclei are considered in the report. The mechanism of such interactions is discussed. 52 refs, 15 figs.

50506 (IAEA-TECDOC—410, pp 257-270) **Filtered medium and thermal neutron beams and their use.** Vertebnyj, V.P.; Murzin, A.V.; Pshenichnyj, V.A.; Litvinskij, L.L.; Pak En Men. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Application of the filtered neutrons beams for nuclear and reactor physics field is reviewed. Experiments have been carried out at Kiev atomic reactors using interference and monocrystal filters. Some results of these experiments are given for the germanium - 74 monocrystal, inelasic scattering cross Sections on the first 2+ levels of /sup 238/U and /sup 232/Th, etc. 37 refs, 15 figs, 3 tabs.

50507 **(INDC(NDS)—190/G-F-R) Proceedings of the IAEA consultants' meeting on the assessment of the results of the REAL-84 exercise.** Zsolnay, E.M.; Nolthenius, H.J.; Piksaikin, V. (eds.). (International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee). Mar 1987. 36p. (CONF-8609320—). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703434.

From IAEA consultants' meeting on the assessment of the results of the REAL-84 exercise; Budapest, Hungary (8 Sep 1986).

The document contains the proceedings of a consultants' meeting organized by the IAEA to discuss the assessment of the results of the REAL-84 exercise. The aim of the exercise is to improve the assessment of accuracies in radiation damage predictions by various laboratories using good quality input data and proper calculation methods. The emphasis lies on radiation damage to reactor pressure vessels and related nuclear technology. The purpose of the meeting was to consider the progress, the presentation of the results and their interpretation, the discussion of scientific phenomena and to suggest recommendations for future actions by the IAEA and participants. Refs, figs, tabs.

50508 (INIS-BR—688, pp 31) **Fragmentation of heavy ions at high energies.** Nemes, M.C. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

A general review on theoretical and experiental situations of heavy ion interactions at relativistc energies is presented. The schematic representation of the difference between spectator and participants of a reaction is described. The Glauber theory to calculate, theoretically, the fragmentation cross sections is used. The description of participant nucleons by Fireball Model and phenomenological interpretations of experimental results are done. (M.C.K.).

50509 (INIS-BR—688, pp 155) **Ionization of the K shell in an adiabatic process.** Castro Faria, N.V. de; Freire Junior, F.L.; Montenegro, E.C.; Pinho, A.G. de; Sigaud, G.M.; Silveira, E.F. da. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50510 (INIS-BR—714, pp 207-288) **Experimental determination of high angular momentum states.** Barreto, J.L.V. (Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1 Aug 1985. (In Portuguese). NTIS (US Sales Only), PC A14/MF A01. File Number DE87703466. (CONF-8502157—Vol.1).

From 2. nuclear physics session of the Jorge Andre Swieca summer school; Rio de Janeiro, RJ, Brazil (1 Feb 1985).

The current knowledge of the atomic nucleus structure is summarized. A short abstract of the nuclear properties at high angular momentum and a more detailed description of the experimental methods used in the study of high angular momenta is made. (L.C.).

50511 (INIS-BR—838) **Proceedings of the 9. Workshop on Nuclear Physics - Communications of applied nuclear physics and instrumentation.** (Sociedade Brasileira de Fisica, Rio de Janeiro). 1986. 99p. (In Portuguese). (CONF-8608195—Pt.2). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734.

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The communications of applied nuclear physics and intrumentation of 9. Workshop on Nuclear Physics in Brazil are presented. Several intruments for radiation measurements, such as detectors, dosemeters and spectrometers were developed. Techniques of environmental monitoring and instrument monitoring for nuclear medicine are evaluated. (M.C.K.).

50512 (JINR—E-1-86-579) **Nucleon emission from target nuclei which occurs when hadrons traverse them.** Strugalski, Z. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1986. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703626.

Emission of fast nucleons, of fast protons in particular, from target nuclei which occurs when hadrons traverse them is studied. The passages of hadrons through xenon nuclei are observed; hadrons, in passing through nuclear matter, cause intensive emission of fast nucleons, in particular of fast protons observed usually. The nucleon emission in the passages proceeds in the same manner as in events in which particles are produced. Energy spectra and angular distributions of the protons in various classes of the events are compared. 15 refs.; 6 figs.; 2 tabs.

50513 (LA—9303-M-Vol.3) **The NJOY Nuclear Data Processing System: Volume 3, The GROUPR, GAMINR, and MODER modules.** MacFarlane, R.E.; Muir, D.W. (Los Alamos National Lab., NM (USA)). Oct 1987. Contract W-7405-ENG-36. 102p. (ENDF—324-Vol.3). NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE88000356.

The NJOY Nuclear Data Processing System is a comprehensive computer code package for producing pointwise and multigroup cross sections and related quantities from ENDF/B-IV, V, or VI evaluated nuclear data. A concise description of the code system and references to the ancestors of NJOY are given in Vol. 1 of this report. This volume describes the GROUPR module, which produces multigroup neutron interaction cross sections and group-to-group production cross sections for neutrons and photons; the GAMINR module, which produces multigroup photon-interaction cross sections and group-to-group matrices; and the MODER module, which converts ENDF/B and NJOY interface files back and forth between formatted (i.e., BCD, ASCII) and binary modes and performs several associated editing functions. 34 refs., 13 figs.

50514 **Recent references.** Ramavataram, S. (Brookhaven National Laboratory, Upton, New York 11973). *Nuclear Data Sheets;* **52**: No. 3, 463-463(Nov 1987). Contract AC02-76CH00016;AC05-84OR21400.

A reaction and keyword index is given for all literature received by the National Nuclear Data Center or assigned key numbers between May and August 1987. (AIP) copyright 1987 Academic Press, Inc.

6512 Nuclear Properties And Reactions, A=1-5, Experimental

50515 (BNL—40210) **Few body hypernuclear systems: Weak decays.** Dover, C.B. (Brookhaven National Lab., Upton, NY (USA)). 1987. Contract AC02-76CH00016. 14p. (CONF-8708143—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014920.

From 11. European conference on few-body physics; Fontevraud, France (31 Aug 1987).

The experimental and theoretical situation regarding mesonic and non-mesonic decays of light hypernuclei is reviewed. Although some models give reasonable results for pionic decays as well as the total weak decay rate, no existing approach explains, even qualitatively, the observed spin-isospin dependence of $\Lambda N \rightarrow NN$ non-mesonic weak decays. 31 refs., 2 figs.

50516 (CEA-CONF—8833) **Seeing meson exchange currents.** Frois, B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Nucleaire a Haute Energie). Sep 1986. 8p. (CONF-8609163—14). NTIS (US Sales Only), PC A02/MF A01. File Number DE87752811.

From International conference and symposia on unified concepts of many-body problems; Stony Brook, NY, USA (4 Sep 1986).

Two very simple cases of nuclear processes dominated by meson exchange currents are discussed. There is a new generation of data in which non-nucleonic components are the dominant contribution. By spanning an extended momentum transfer range one has clearly observed the pion, the rho-meson and the δ-isobar currents.

50517 (IAEA-TECDOC—410, pp 115-119) **Differential neutron production cross-sections in the D(d,np) reaction.** Kagalenko, A.B.; Kornilov, N.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The available experimental data on differential neutron production cross-section in break-up reaction have been analysed. A number of regularities that have allowed the estimation of the cross-section and neutron spectra at zero degrees for the energy range from a threshold to — 11 MeV in the laboratory system has been established. An angular dependence of the neutron spectra has been determined for the initial deuteron energy of — 10 MeV. Neutron yield averaged over the /sup 235/U, /sup 238/U fission cross-section have been calculated. 7 refs, 6 figs, 1 tab.

50518 (IAEA-TECDOC—410, pp 120-124) **Distortions of neutron flux and energy spectrum during deuteron bombardment of solid deuterium and tritium targets.** Funstein, V.B.; Khlebnikov, S.V.; Nemilov, Yu.A.; Selitskij, Yu.A. (Radievyj Inst., Leningrad, USSR). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The method of (d,p)-reactions is applied for the determination of neutron flux and energy spectrum distortions during deuteron bombardment of solid deuterium-titanium and tritium-titanium targets. The neutron background caused by deuterium accumulation in target backings, carbon build-up, substitution of tritium for deuterium and deuteron or triton break-up is analyzed. 5 refs, 6 figs.

50519 **(LA-UR—87-3053) Pion-induced meson production in nuclei: The (π,eta) and the (π^+,K^+) reactions.** Peng, J.C. (Los Alamos National Lab., NM (USA)). Jun 1987. Contract W-7405-ENG-36. 20p. (CONF-8706166—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000526.

From International symposium on medium energy physics; Beijing, China (23 Jun 1987).

The subject of meson productions in nuclei, a new direction in pion-nucleus physics, is discussed. Recent experimental results at LAMPF and AGS on the (π,eta) and (π^+,K^+) reactions in nuclei are presented. 37 refs., 14 figs., 4 tabs.

50520 **(LBL—23816) Muon catalyzed DT [deuterium-tritium] fusion at low temperature.** Crowe, K.M. (Lawrence Berkeley Lab., CA (USA)). Jun 1987. Contract AC03-76SF00098. 11p. (CONF-8706161—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000619.

From 2. international conference on muon and pion interactions in matter; Dubna, USSR (30 Jun 1987).

Several experimental programs are currently under way to study muon catalyzed fusion (MCF). The largest efforts were made at Los Alamos, New Mexico, and at the Swiss Institute for Nuclear Research (SIN). First results indeed confirm the existence of a very rapid DT cycle producing multiple fusions of the type $d\mu t \rightarrow \alpha + n + \mu + 17.6$ MeV. This paper presents a systematic experimental investigation of MCF at low temperatures (12 to 35K) in gas, liquid and solid of various densities and tritium concentrations. Our improved analysis allows a clear separation of intrinsic dt sticking from kinetic effects. Strongly density-dependent cycle rates with values up to 1.93 x 10^8 s^{-1}, yields of 124 fusions per muon, and sticking lower than theoretically predicted, but with no strong dependence on either tritium concentration or density are reported. 8 refs., 4 figs.

6513 Nuclear Properties And Reactions, A=6-19, Experimental

50521 **(CONF-870413—11) Inclusive electron scattering at high Q^2 in the region $1 < x < 3$.** Day, D. (Virginia Univ., Charlottesville (USA). Inst. of Nuclear and Particle Physics). 1987. Contract FG05-86ER40261. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000058.

From 11. international conference on particles and nuclei; Kyoto, Japan (20 Apr 1987).

New inclusive electron scattering data at high Q^2 from nuclei taken in the x range unavailable to the free nucleon are presented. The ratios of cross section per nucleon, (4/56)d σ/sup Fe// d σ/sup He/, show a plateau for $1.3 < x < 2.0$ which has been suggested as a signature of quark clusters in nuclei. The subtraction of the quasielastic cross section from the inclusive spectra reveals that the data scale in x at low momentum transfer. A proposal for a new experiment is discussed. 16 refs., 6 figs.

50522 (IAEA-TECDOC—410, pp 80-89) **Neutron energy spectra and yields produced from thick targets by light-mass heavy ions.** Nakamura, T.; Uwamino, Y. (Tokyo Univ., Japan. Inst. for Nuclear Study). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The measured neutron energy spectra produced from thick targets by light-mass heavy ion beams were analyzed with the phenomenological hybrid model of equilibrium and pre-equilibrium emissions. The neutron energy spectra are fitted to two (in the energy region of incident projectile energy lower than 100 MeV) and three (in the energy region of incident projectile energy higher than 100 MeV) Maxwellian-type components. The lowest energy component corresponds to the evaporation neutrons from a compound nucleus having a nuclear temperature independent to the neutron emission angle and the higher two components to the pre-equilibrium neutron emission having a nuclear temperature depending on the angle. The total neutron yield was evaluated by surveying several published papers and estimating the neutron yield below a few MeV by fitting some spectra measured above that energy to the Maxwellian distribution. In order to use for the neutron activation cross section measurement and the induced radioactivity study, a pseudo-monoenergetic neutron beam course in the energy range from 15 to 40 MeV was installed by using the Be(p,n) reaction. The peak neutron energy changes with the proton energy and the beam intensity was relatively high. 14 refs, 9 figs, 2 tabs.

50523 (IAEA-TECDOC—410, pp 90-98) **D(Be) neutron fields and their applications in nuclear reaction cross-section studies.** Qaim, S.M. (Kernforschungsanlage Juelich G.m.b.H., Germany, F.R. Inst. fuer Nuklearchemie). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

A short review of some of the properties of d(Be) neutrons is given and the methods of spectrum characterization using various detectors are outlined. Some of the integral tests done using such spectra are discussed. Nuclear reaction cross-section measurements, especially on high-threshold (n,t) and (n,/sup 3/He) reactions, employing activation and other off-line methods are described. Those studies have contributed significantly to an understanding of the phenomenon of trinucleon emission. A recent effort to determine the excitation function of an (n,t) reaction via irradiations in various neutron fields is discussed. 33 refs, 10 figs, 2 tabs.

50524 (INIS-BR—688, pp 159) **Interaction study between similar mass number nuclei.** Koide, K.; Faro, L.B.C.W. de; Ito, O.T.; Dietzsch, O.; Takai, H.; Bairrio Nuevo Junior, A. (Sao Paulo Univ., Brazil. Inst. de Fisica; Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50525 (INIS-BR—688, pp 161) **Elastic scattering and alpha transfer reactions in backscattering.** Lichtenthaler Filho, R.; Lepine-Szily, A.; Portezan Filho, O.; Villari, A.C.C.; Fernandes, M.A.G.; Rotberg, V.H. 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50526 (INIS-BR—688, pp 176) **Measurements of heavy ions stopping power in solids.** Rotberg, V.H.; Vilela, M.M.; Villari, A.C.C.; Ribas, R.V. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50527 (INIS-BR—688, pp 179) **/sup 10/,/sup 11/B(p,n)/sup 10/,/sup 11/C reactions between Ep=13.7 and 14.7 Mev.** Schelin, H.R.; Wylie, W.R.; Cardoso Junior, J.L.; Pessoa, E.F.; Douglas, R.A. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Sao Paulo Univ., Brazil. Inst. de Fisica; Universidade Estadual de Campinas, Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50528 **(LA-UR—87-3191) Direct thermal neutron capture.** Raman, S.; Kahane, S.; Lynn, J.E. (Oak Ridge National Lab., TN (USA); Los Alamos National Lab., NM (USA)). 1987. Contract AC05-84OR21400;W-7405-ENG-36. 9p. (CONF-8708101—12). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000489.

From 6. international symposium on capture gamma-ray spectroscopy; Leuven, Belgium (31 Aug 1987).

We discuss the direct-capture theory pertaining to primary electric dipole (E1) transitions following slow-neutron capture. For light nuclides that we have studied (including ^{9}Be, ^{12}C, ^{13}C, ^{24}Mg, ^{25}Mg, ^{26}Mg, ^{32}S, ^{33}S, ^{34}S, ^{40}Ca, and ^{44}Ca), estimates of direct-capture cross sections using optical-model potentials with physically realistic parameters, are in reasonable agreement with the data. Minor disagreements that exist are consistent with extrapolations to light nuclides of generally accepted formulations of compound-nucleus capture. We also discuss the channel-capture approximation which is, in general, a good representation of these cross sections in heavier nuclei particularly if the scattering lengths are not different from the corresponding potential radii. We also draw attention to cases where the use of this formula leads to inaccurate predictions. 9 refs., 1 fig., 2 tab.

50529 **Low energy antiproton annihilation in nuclei.** Di Giacomo, N.J.; De Vries, R.M.; McGaughey, P.L.; Sondheim, W.E.; Sunier, J.W.; Buenerd, M.; Chauvin, J.; Lebrun, D.; Martin, P.; Dovsse, J.C. (Physics Div., Los Alamos National Lab.). pp 528 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

A high statistics study of 600 MeV/c antiproton annihilation in /sup 12/C, /sup 28/Si, /sup 89/Y, /sup 208/Pb and /sup 238/U was completed recently at the LEAR (CERN). The d/sup 2/σ/dΩdp for π/sup +-/, K/sup +-/, p, d, t and α and multiparticle correlations (e.g. /sup $\pi\pi$/, /sup π/p, pp) were measured using the CALLIOPE 360^{0} magnetic spectrometer. In conjunction, for /sup 28/Si the radial location of the annihilation in the nucleus was ascertained via the magnitude of the nuclear excitation energy deposited in an active Si target/detector. The inclusive data (particularly the kaon yields) are examined to determine the effect of the nuclear medium on the N-bar-N annihilation process, and the space-time structure of the annihilation region is extracted via pion intensity interferometry.

6514 Nuclear Properties And Reactions, A=20-38, Experimental

50530 (INIS-BR—688, pp 182) **Measurement of stopping power of heavy ions in silicon using sandwich type targets.** Vilela, M.M.; Rotberg, V.H.; Villari, A.C.C. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50531 (INIS-BR—837, pp 12) **Intern Bremsstrahlung of /sup 55/Fe.** Isaac, M.C.P.; Vanin, V.R. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50532 (INIS-BR—838, pp 40) **Production of /sup 22/Na carrier-free for application in time spectroscopy.** Brito, J.L.Q. de. (Instituto de Engenharia Nuclear, Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

6515 Nuclear Properties And Reactions, A=39-58, Experimental

50533 (IAEA-TECDOC—410, pp 270-273) **Monoenergetic neutrons from the /sup 45/Sc(p,n)/sup 45/Ti reaction.** Cosack, M.; Lesiecki, H.; Hunt, J.B. (Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, F.R.; National Physical Lab., Teddington, UK). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The /sup 45/Sc(p,n)/sup 45/Ti reaction was investigated with good energy resolution by a DC-beam method and the time-of-flight technique at both PTB and NPL. A number of isolated resonances were found in the energy region from 8 to 40 keV. The energy width of the levels is well below 1 keV (FWHM). The reaction was used for the calibration of instruments in the keV region. 9 refs, 3 figs.

50534 (INIS-BR—837, pp 1) **/sup 57/Ni decay.** Scardino, A.M.S.; Helene, O.A.M.; Vanin, V.R.; Pascholati, P.R. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50535 **(TRI-PP—87-47) Gamow-Teller strength functions from N-nucleus scattering experiments at 200-400 MeV.** Haeusser, O.; Vetterli, M.C. (Simon Fraser Univ., Burnaby, British Columbia (Canada); TRIUMF, Vancouver, British Columbia (Canada)). May 1987. 5p. (CONF-870413—12). NTIS (US Sales Only), PC A02/MF A01. File Number DE87900984.

From 11. international conference on particles and nuclei; Kyoto, Japan (20 Apr 1987).

Recent measurements of (n,p), (p-vector,p-vector) and (p,n) reactions at TRIUMF have made possible a detailed examination of the spin-isospin structure of nuclear excitations up to 50 MeV. Cross sections for ^{54}Fe(n,p)^{54}Mn and spin-flip cross sections for ^{54}Fe(p-vector,p-vector) near 300 MeV have been used to estimate the nuclear response for different multipoles L, spin transfers (ΔS = 0,1), and isospins of the residual nucleus (T/sub f/ = 1,2). Qualitative features of the spin-flip probabilities in (p-vector,p-vector) are in good agreement with recent surface-RPA calculations. Between 200 and 400 MeV the ΔL = 0 spin-flip isovector component is well described by the central part of the Franey-Love interaction. The Gamow-Teller strength S/sub +/ in ^{54}Fe, which is of significance in models of pre-collapse supernovae, is found to be smaller by a factor of two than the best available shell model calculations. In (sd)-shell nuclei (/sup 24,26/Mg,^{28}Si) about 70 +- 15%) of the Gamow-Teller strength predicted by untruncated shell-model calculations is found at low excitation. 24 refs., 7 figs.

6516 Nuclear Properties And Reactions, A=59-89, Experimental

50536 **(ANL/NDM—101) Cobalt, fast neutrons and physical models: Nuclear data and measurements series.** Smith, A.B.; Guenther, P.T.; Whalen, J.F.; Lawson, R.D. (Argonne National Lab., IL (USA)). Jul 1987. Contract W-31109-ENG-38. 66p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000611.

Energy-averaged neutron total cross sections of cobalt were measured from ≅0.5 to 12.0 MeV. Differential elastic- and inelastic-scattering cross sections were measured from ≅1.5 to 10.0 MeV over the scattering-angle range ≅18° to 160°, with sufficient detail to define the energy-averaged behavior. Inelastic neutron groups were observed corresponding to "levels" at: 1115 +- 29, 1212 +- 24, 1307 +- 24, 1503 +- 33, 1778 +- 40, 2112 +- 40, 2224 +- 35, 2423 +- 39, 2593 +- 41 and 2810 keV. The experimental results were interpreted in terms of the spherical optical-statistical and coupled-channels models. An unusually successful description of observables was achieved over a wide energy range (<-15.0 to > 20.0 MeV) with a spherical model having energy-dependent strengths and geometries. The energy dependencies are large below ≅7.0 MeV (i.e., ≅19.0 MeV above the Fermi energy), but become smaller and similar to those reported for "global" potentials at higher energies. The imaginary strength is large and decreases with energy. These imaginary-potential characteristics are attributed to neutron shell closure and collective-vibrational processes. The weak-coupling model also offers an explanation of the unusual negative energy slope and relatively small radius of the imaginary potential. The spherical optical model derived from the neutron-scattering results was extrapolated to bound energies using the dispersion relationship and the method of moments. The resulting real-potential strength and radius peak at ≅-10.0 MeV, while concurrently the real diffuseness is at a minimum. The extrapolated potential is ≅8% larger than that implied by reported particle-state energies, and ≅13% smaller than indicated by hole-state energies. 68 refs., 15 figs., 1 tab.

50537 **(IFUSP-P—620) Experimental techniques used in the measurements of the fusion cross section for the /sup 63/ ,/sup 65/Cu/sup +16/O systems.** Pereira, D.; Acquadro, J.C.; Sala, O.; Chamon, L.C.; Rocha, C.A.; Ramirez, G.; Tenreiro, C.F. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Dec 1986. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703433.

The experimental techniques used in the measurement of evaporation residue cross sections for the systems /sup 63/,6/sup 5/Cu+/sup 16/O are described. These measurements were carried out using the time of flight method in conjuction with an electrostatic deflector to removal the beam like particles.

50538 (INIS-BR—688, pp 164) **Experimental test of the Bremsstrahlung spectrum.** Martins, M.N.; Wolynec, E.; Hayward, E.; Marayama, X.; Schima, F.; Lamaze, G. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50539 (INIS-BR—688, pp 166) **γ-γ angular correlation for /sup 81/Br and /sup 83/Br transitions.** Matheus, R.; Saxena, R.N. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50540 (INIS-BR—688, pp 172) **Measurements of weak transitions in β/sup +/ and β/sup -/ decays of /sup 84/Rb.** Passaro, A.M.P.; Goldman, I.D. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50541 (INIS-BR—688, pp 174) **Study of the /sup 63/Cu (e, 2p) cross section.** Pastura, V.F.S.; Wolynec, E. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50542 (INIS-BR—688, pp 175) **Study of the giant isovectorial electric quadrupole resonance in the /sup 63/Cu.** Pastura, V.F.S.; Wolynec, E. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50543 (INIS-BR—837, pp 25) **Study of nuclear fusion of the /sup 64/Zn + /sup 16/O system.** Acquadro, J.C.; Tenreiro, C.F.; Freitas, P.A.B.; Liguori Neto, R. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50544 (INIS-BR—837, pp 33) **Study of nuclear excitation mechanics of /sup 64/Zn in the energy range from 6 to 60 Mev by electro and photodisintegration.** Carvalheiro, Z.; Arruda Neto, J.D.T.; Martins, M.N. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50545 (INIS-BR—837, pp 18) **Photonuclear reactions of cobalt and zirconium elements at energies — 1 GeV.** Lima, D.A.; Husmann, D.; Sousa, E.V. de; Martins, J.B.; Tavares, O.A.P.; Milomen, W.C.C. (Paraiba Univ., Joao Pessoa, Brazil. Dept. de Fisica; Bonn Univ., Germany, F.R.; Paraiba Univ., Campina Grande, Brazil. Dept. de Fisica; Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro; Mato Grosso Univ., Cuiaba, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

6517 Nuclear Properties And Reactions, A=90-149, Experimental

50546 **(CONF-870970—5) Energy levels and structure of light rare-earth nuclei, /sup 136,138,140/Sm and /sup 132,134,136/Nd, via beta decay.** Kern, B.D.; Leander, G.A.; Mlekodaj, R.L.; Carter, H.K.; Kortelahti, M.O.; Zganjar, E.F.; Braga, R.A.; Fink, R.W.; Perez, C.P.; Semmes, P.B. (Kentucky Univ., Lexington (USA); Oak Ridge Associated Universities, Inc., TN (USA); Louisiana State Univ., Baton Rouge (USA); Georgia Inst. of Tech., Atlanta (USA). School of Chemistry; Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000569.

From 5. international conference on nuclei far from stability; Lake Rosseau, Canada (14 Sep 1987).

Levels in /sup 136,138,140/Sm were populated by the beta decay of Eu, following (HI,pxn) reactions and on-line mass separation. Members of the γ band were observed in all three daughter nuclei. Spectroscopic calculations were made using the triaxial rotor model, with all parameters derived microscopically from a Woods-Saxon deformed shell model. Comparison with the data

supports the characterization of these nuclei in terms of a triaxial intrinsic shape. Improved decay schemes for /sup 132,134,136/Nd are given. 3 refs., 7 figs.

50547 (IAEA-TECDOC—409, pp 137-138) **Nuclear structure studies using reactor fast neutrons for (n, n'γ) reactions.** Veres, A. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The nuclear research reactor WWR-S serves for nuclear structure studies using fast neutrons for (n, n'γ) reactions. The determination of nuclear data of the /sup 94/Mo, /sup 98/Mo, /sup 100/Mo, /sup 96/Zr, /sup 138/Ba and /sup 140/Ce is presented.

50548 (INIS-BR—688, pp 153) **Aspects of the /sup 103/Ru structure.** Duarte, J.L.M.; Matsushigue, L.B.H.; Sirota, S.; Borello-Lewin, T.; Dietzsch, O. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50549 (INIS-BR—688, pp 156) **/sup 94/Zr excited states in the /sup 94/Zr (d,d')/sup 94/Zr* reaction at 15.5 MeV.** Frota-Pessoa, E.; Joffily, S. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50550 (INIS-BR—688, pp 187) **Study of the 16.28 MeV analog state of /sup 90/Zr.** Wolynec, E.; Dodge, W.R.; Hayward, E. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50551 (INIS-BR—688, pp 188) **/sup 101m/Rh and /sup 101f/Rh decays and the /sup 101/Ru nuclear structure.** Vanin, V.R.; Passaro, A.; Passaro, A.M.P.; Cruz, M.T.F. da; Lejbman, I.D.G. vel. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50552 (INIS-BR—691) **γ-γ angular correlation for transitions in /sup 101/Tc.** Zamboni, C.B.; Saxena, R.N. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). [1987]. 4p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703451.

The experimental results of the directional angular correlation of coincident gamma transitions in the /sup 101/Tc nuclei; from /sup 101/Mo β decay. The molybdenum sources were produced by /sup 100/Mo irradiating with thermal neutron flux of the IEA-R1 reactor. The measurements of γ-γ coincidences for several cascades were done in the 90/sup 0/, 120/sup 0/, 150/sup 0/ e 180/sup 0/ angles using an automatic spectrometer (with a high purity Ge detector and a NaI(Tl) detector) and a manual spectrometer (with a high purity Ge detector and a Ge(Li) detector). Measurements for fifteen gamma cascades, resulting in the determination of multipole mixing ratios for nineteen transitions were carried out. The spin and parity of transition levels were established and confirmed. (M.C.K.).

50553 (INIS-BR—837, pp 4) **High spin states in /sup 108/Ag and /sup 107/Ag.** Cybulska, E.W.; Ribas, R.V.; Seale, W.A.; Rao, N.; Almeida, M. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50554 (INIS-BR—837, pp 6) **Strong excited states of /sup 100/Ru and /sup 102/Ru in proton scattering.** Duarte, J.L.M.; Sirota, S.; Horodynski-Matsushigue, L.B.; Borello-Lewin, T. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50555 (INIS-BR—837, pp 9) **γ-γ angular correlation for /sup 101/Tc transitions.** Zamboni, C.B.; Saxena, R.N. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil. Divisao de Fisica Nuclear). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50556 (INIS-BR—837, pp 38) **Systematic of fusion bellow barrier: structure effects and/or neck formation.** Nemes, M.C.; Tomio, L. (Sao Paulo Univ., Brazil. Inst. de Fisica; Pernambuco Univ., Recife, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

6518 Nuclear Properties And Reactions, A=150-189, Experimental

50557 (INIS-BR—688, pp 180) **Multipolarity of the transitions in the /sup 181/Ta electrodisintegration.** Serrao, V.A.; Wolynec, E.; Martins, M.N. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50558 (INIS-BR—688, pp 185) **Photoneutron cross sections.** Wolynec, E.; Serrao, V.A.; Gouffon, P.; Miyao, Y.; Martins, M.N. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50559 (INIS-BR—837, pp 44) **Neutron emission during dinuclear stage in heavy ion fusion reactions.** Canto, L.F.; Donangelo, R.J.; Carlson, B.V.; Hussein, M.S. (Rio de Janeiro Univ., Brazil. Inst. de Fisica; Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The dependence of neutron emission probabilities of the compound nuclei /sup 156/Er at E= 48 MeV is studied by two entrance channels: /sup 12/C + /sup 144/Sm and /sup 64/Ni + /sup 92/Zr. The neck equilibrium times in two systems are related with neutron emission probability.

50560 **Nuclear data sheets for A = 154.** Helmer, R.G. (Idaho National Engineering Laboratory, EG & G Idaho, Inc., Idaho Falls, Idaho 83415). *Nuclear Data Sheets;* **52**: No. 1, 1-126(Sep 1987).

The experimental results from the various reaction and decay studies leading to nuclides in the A = 154 mass chain, and alpha decays from it, have been reviewed. These data are summarized and presented, together with adopted level schemes and properties. copyright 1987 Academic Press, Inc.

50561 **Nuclear data sheets for A = 180.** Browne, E. (Lawrence Berkeley Laboratory, Berkeley, California 94720). *Nuclear Data Sheets;* **52**: No. 1, 127-303(Sep 1987). Contract AC03-76SF00098.

Spectroscopic data for all nuclei with mass number A = 180 have been evaluated, and the corresponding level schemes from radioactive decay and reaction studies are presented. Salient topics of this evaluation are the new limit (0.023%) for the fractional population of /sup 180/Hf (5.5 h) from /sup 180/Lu, and the negative search for a possible /sup 180/Lu isomer with a half—life between 10 s and 5 min. Both results may help in expanding the natural abundance of the long—lived /sup 180/Ta isomer in terms of the slow (S) and/or the rapid (R) neutron capture processes of nucleosynthesis in stars. copyright 1987 Academic Press, Inc.

50562 **Precision measurements of the Σ/sup -/ mass and magnetic moment and the K/sup -/ mass.** Miller, J.P.; Austin, E.; O'Brien, F.; Roberts, B.L.; Tieger, D.R.; Eckhause, M.; Oinkel, J.; Guss, P.P.; Hertzog, D.W.; Joyce, D. (Boston Univ., Boston, MA). pp 528 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

X-ray energies from K/sup -/ and Σ/sup -/ atoms with Pb, W and U nuclei have been measured at the Brookhaven National Lab AGS. K/sup -/ from the separated C4 beam were stopped in a laminar target which consisted of sheets of the target material immersed in liquid hydrogen. π/sup +/ from the reaction rho(K/sup -/,π/sup +/)Σ/sup -/ were used to tag Σ/sup -/ production. X rays in coincidence with a K/sup -/ stop were sorted into raw (predominatly K/sup -/) and tagged (Σ/sup -/) spectra. The transition energies are, to first order, proportional to the mass, and the fine-structure-splitting was used to determine the magnetic moment. The masses were obtained from the Pb and W data μ(Σ/sup -/) was determined from all three targets. The errors on the masses are expected to be a factor of 2 to 3 more precise than the tabulated masses. Results for μ(Σ/sup -/) from a subset of these data have been published previously.

6519 Nuclear Properties And Reactions, A=190-219, Experimental

50563 **(CBPF-NF—015/86) Radioactive decay of radium and radon isotopes by /sup 14/C emission.** Carvalho, H.G. de; Martins, J.B.; Tavares, O.A.P. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703356.

Estimates are given for the half-lives of the radioactive decay of radium and radon isotopes by emission of /sup 14/C nuclei. The classical one-dimensional WKB approximation for penetration through a pure Coulomb barrier is used the calculations. Results indicate that the naturally occuring radon isotopes are /sup 14/C emitters like their parents radium isotopes whose activities by emission of /sup 14/C nuclei have been recently measured. The predicted half-lives for decay of /sup 219/Rn, /sup 220/Rn and /sup 222/Rn by emission of /sup 14/C nuclei are in the range 10/sup 11/-10/sup 13/ yr. For radium and radon isotopes the minimum half-life is obtained when the double-magic /sup 208/Pb and the semi magic /sup 206/Hg are the daughter products, respectively, of these new radioactive decay modes.

50564 **(CONF-8708101—10) Ground state partial radiative widths of ^{207}Pb + n resonances and M1 and E2 strengths in ^{208}Pb.** Weigmann, H.; Koehler, R.; Poortmans, F.; Raman, S.; Wartena, J.A. (Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements; Centre d'Etude de l'Energie Nucleaire, Mol (Belgium). Studiecentrum voor Kernenergie; Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87012933.

From 6. international symposium on capture gamma-ray spectroscopy; Leuven, Belgium (31 Aug 1987).

Ground state partial radiative widths of neutron resonances in ^{207}Pb + n have been measured. A resonance analysis has been carried out in a complete manner below 700 keV neutron energy, and for selected strongly radiation resonances up to 1 MeV. The total magnetic dipole strength detected above neutron separation energy is only 6.8 μ_0^2, but the observed appreciable fragmentation of the M1 strength suggests that considerable strength is missed at excitation energies above 8 MeV. The electric quadrupole strength observed between neutron separation energy and 8.2 MeV is distributed rather uniformly, and corresponds to 4.9% of the energy-weighted sum-rule for isoscalar E2 transitions. 10 refs., 2 figs.

50565 **(CONF-8708123—2) E4 moments for deformed rare-earth and heavy transitional nuclei.** Baker, F.T. (Georgia Univ., Athens (USA). Dept. of Physics and Astronomy). Aug 1987. Contract FG09-87ER40354. 13p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014934.

From International conference on nuclear structure through static and dynamic moments; Melbourne, Australia (25 Aug 1987).

Techniques for measuring reduced matrix elements $<4^+$ parallel M(E4) parallel $0^+>$, the interpretation of these data, and the implications for various nuclear models are reviewed and discussed. Actual examples are confined to deformed rare-earth and heavy transitional nuclei. 33 refs., 9 figs.

50566 (INIS-BR—688, pp 63) **Coincidence gamma spectroscopy in the Tandem accelerator of Strasbourg - The /sup 219/Ac.** Helene, O.A.M. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

The study of the /sup 219/Ac nuclei by experiments performed in the 18MV MP Tandem accelerator of the Nuclear Research Center in Strasbourg is presented. The data acquisition system, the experimental arrangement for γ-γ and γ-γ-γ coincidence measurements, and the experimental arrangement for angular distribution measurement are described. The /sup 219/Ac was formed by fusion-evaporation process which promotes the formation of high angular momentum states. The /sup 13/C + /sup 209/Bi->-> /sup 219/Ac + 3n and /sup 15/N + /sup 208/Pb-> /sup 219/Ac + 4n reactions were done. The /sup 219/Ac was identified by measurements of delayed alpha spectroscopy using pulsed beam. The investigation on gamma excitation function using energy beams between 63 and 73 MeV was done. The experimental data on the /sup 13/C + /sup 209/Bi reaction are analysed. (M.C.K.).

50567 (INIS-BR—688, pp 152) **Study of the /sup 209/Bi eletrofission cross section.** Dias, F.R.O.; Herdade, S.B.; Arruda Neto, J.D.T. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50568 (INIS-BR—688, pp 168) **Study of giant resonance of M1-transitions in /sup 208/Pb.** Miyao, Y.; Gouffon, P.; Wolynec, E.; Martins, M.N.; Serrao, V.A.; Martinez, A.R.V.; Cataldi, M.I.C. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50569 (INIS-BR—837, pp 27) **Electrodisintegration of / sup 209/Bi by neutron emission.** Cataldi, M.I.C.; Wolynec, E. 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50570 (INIS-BR—837, pp 30) **Electrodisintegration of / sup 208/Pb by neutron emission.** Cataldi, M.I.C.; Wolynec, E.; Miyao, Y.; Gouffon, P.; Martins, M.N. 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

6520 Nuclear Properties And Reactions, A=220 And Above, Experimental

50571 (IAEA-TECDOC—410, pp 125-143) **Review of measurements of the prompt fission neutron spectrum from the spontaneous fission of Cf-252.** Boldeman, J.W. (Australian Atomic Energy Commission Research Establishment, Sutherland. Lucas Heights Research Labs.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

A review is presented of experimental determinations of the prompt fission neutron spectrum from the spontaneous fission of / sup 252/Cf. Special attention has been given to post-1979 measurements. 61 refs, 9 figs, 6 tabs.

50572 (IAEA-TECDOC—410, pp 171-182) **Cf-252 fission neutron spectrum as an integral field.** Kimura, I.; Kobayashi, K.; Horibe, O. (Kyoto Univ., Kumatori, Osaka, Japan. Research Reactor Inst.; Kinki Univ., Osaka, Japan. Dept. of Reactor Engineering). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

By making use of the average cross section data (Mannhart's evaluation) for twenty-five reactions measured with the /sup 252/Cf spontaneous fission neutron source, its spectral shape was unfolded by NEUPAC. As a whole, the result agrees with the predicted ones by Madland and by Maerten and with the measured one by Poenitz and Tamura, but obviously differs from the Maxwellian spectrum with its average energy E/sub av/=2.13 MeV. The influence of each cross section data to the shape of the unfolded spectrum was investigated. The /sup 252/Cf spectrum averaged cross sections for the above reactions were calculated by making use of energy dependent cross section data from ENDF/B-V (dosimetry file), JENDL-2 and internal library of NEUPAC and of six expressions of its spectral shape; (1) Maxwellian (E/sub av/=2.13), (2) Madland's prediction, (3) Maerten's predictions (CEM and GMNM), (4) Gerasimenko's prediction, and (5) the spectrum unfolded by NEUPAC. By comparison of the calculated values with the measured ones, checked were the shape of the /sup 252/Cf fission neutron spectrum and the convergence between the measured and calculated cross section data. The average cross section data for the above reactions were tried to be plotted by the Horibe's empirical rule. Although the number of data is rather restricted, we can see good systematics for the (n,p), (n,α) and (n,2n) reactions similar to the case of the average cross sections to the /sup 235/U fission neutron spectrum. 23 refs, 7 figs, 4 tabs.

50573 (IAEA-TECDOC—410, pp 183-186) **New experimental and theoretical results of the energy and angular distribution of Cf fission neutrons.** Maerten, H.; Richter, D.; Seeliger, D.; Fromm, W.D.; Neubert, W. (Technische Univ., Dresden, German Democratic Republic; Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden, German Democratic Republic). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Employing a direction-sensitive method of fission fragment detection in conjunction with neutron time-of-flight spectroscopy the energy and angular distribution of Cf fission neutrons has been measured. The correlation experiment and multi-parameter analysis is briefly described. We present first experimental data which are compared with statistical-model calculations in the framework of the complex cascade-evaporation model as well as an extended version of the generalized Madland-Nix model. 10 refs, 6 figs.

50574 (IAEA-TECDOC—410, pp 186-189) **Neutron spectrum of the spontaneous fission of Cf-252 (3-12 MeV neutron energy).** Boettger, R.; Klein, H.; Chalupka, A.; Strohmaier, B. (Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, F.R.; Vienna Univ., Austria. Inst. fuer Radiumforschung und Kernphysik). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

A neutron spectrum of a source with 10/sup 5/ fissions s/sup -1/ installed in a miniature ionization chamber was investigated at the PTB's time-of-flight spectrometer (flight path 12 m, 4 NE 213-type detectors, 25.4 cm x 5.08 cm). Some of the influences exerted on the neutron spectrum, such as efficiency of the ionization chamber for fission fragments, chamber material and corrections of the time-of-flight spectrum are discussed. The preliminary data presented in Antwerp in 1982 were re-analyzed on the basis of a modified efficiency of the neutron detector. The energy spectrum determined in this way is compared with various theoretical models. The Maxwellian distribution generally applied (E/sub o/=1.42 MeV) is incompatible with our results in the 3 to 12 MeV energy range. 5 refs, 4 figs.

50575 (IAEA-TECDOC—410, pp 190-194) **Cf-252 fission neutron spectrum above 15 MeV.** Chalupka, A.; Malek, L.; Tagesen, S.; Boettger, R. (Vienna Univ., Austria. Inst. fuer Radiumforschung und Kernphysik; Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, F.R.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The high energy tail (—15 to 30 MeV) of the neutron spectrum from the spontaneous fission of /sup 252/Cf was measured with excellent shielding against cosmic radiation. No significant deviation from Maxwellian shape (T=1.42 MeV) and no indication of any neutron excess above 20 MeV was found. 12 refs, 6 figs, 2 tabs.

50576 (IAEA-TECDOC—410, pp 194-201) **High energy portion of the Cf-252 neutron spectrum deduced from integral experiments.** Mannhart, W. (Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, F.R.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

To investigate the validity of the neutron excess in the Cf-252 spectrum above 20 MeV first reported by the Dresden group in 1982, the responses of two (n,3n) reactions were measured in a Cf-252 neutron field. The reactions were /sup 107/Ag(n,3n) and /sup 169/Tm(n,3n) which are both sensitive to the shape of the spectrum above 20 MeV. In parallel, the (n,2n) spectrum-averaged cross sections of both reactions were also determined. The experimental results were compared with calculated ones based on various assumptions of the shape of the neutron spectrum. Due to low induced ra-

dioactivities and close sample-to-detector distances, extensive calculations of cascade-summing corrections were made in the radioactivity analysis process before deriving spectrum-averaged cross section data. The comparison of the corrected experimental results with calculated spectrum-averaged data did not confirm the neutron excess above 20 MeV as quoted. 21 refs, 2 figs, 3 tabs.

50577 (IAEA-TECDOC—410, pp 201-207) **Study of the mechanism of Cf-252 spontaneous fission neutron emission.** Batenkov, O.I.; Blinov, A.B.; Blinov, M.V.; Smirnov, S.N. (Radievyj Inst., Leningrad, USSR). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The measurements of differential energy distributions of 252-Cf fission prompt neutrons have been carried out for different emission angles. The correlation of angular and energy distributions of neutrons for different masses and total kinetic energies of the fragments is analysed for clearing up the mechanism of neutron emission. The velocities of the fragments during neutron emission have been determined from the experimental data obtained at small angles. 25 refs, 6 figs.

50578 (IAEA-TECDOC—410, pp 213-216) **Energy and angular distribution of Cf-252 fission neutrons in the low energy range.** Maerten, H.; Richter, D.; Seeliger, D.; Neubert, W.; Lajtai, A. (Technische Univ., Dresden, German Democratic Republic; Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden, German Democratic Republic; Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Experimental and theoretical investigation of the emission of prompt fission neutrons provides information of both practical and fundamental importance. Prompt neutrons from spontaneous fission of /sup 252/Cf, adopted as an international standard have a special significance. As it is well known the energy spectrum of prompt fission neutrons from spontaneous fission of /sup 252/Cf can be described by a Maxwell distribution with a parameter of T=1-42 MeV. The different model calculations can reproduce the measured spectra within 10 percent. More precise double differential spectrum measurements are in progress at the TU in Dresden and at CENM in Geel. In the low neutron energy range, 50 keV-1.2 MeV, NE-912 glass detectors enriched in /sup 6/Li and with an absolutely determined efficiency at a distance of 350 mm from the target have been used for neutron detection. The fission fragments have been detected by two parallel-plate avalanche detectors, one of which, 5 mm far from the target gives the stop signal, while the other 35 x 180 mm large position sensitive detector at 72 mm far from the source divided into 36 segments of 4.5 mm width records the direction of fragment's flight. The distance between the two avalanche detectors, a flight path of 67 mm serves the distinction between the light and heavy fragments. The angular distribution of neutrons have been measured by a $\Delta\theta$=6.5 deg. resolution in the 0 deg. - 180 deg. region. The effect of scattered neutrons and delayed gamma-rays have been measured. The experimental results have been compared with those of Bowman et al at two energies. The agreement is very good at 1 MeV, while at 0.5 MeV there is a small deviation. 7 refs, 6 figs.

50579 (IAEA-TECDOC—410, pp 225-229) **Half-life and the average number of neutrons per an act of Cf-252 fission.** Shlyamin, E.A.; Kharitonov, I.A. (Radievyj Inst., Leningrad, USSR). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The manganese bath method has been used with fragment counting over a small solid angle to measure the value of ν-tilde (/sup 252/Cf). The improved quality of the source active layers has reduced the error in determining the fission rate. The value obtained for ν-tilde (/sup 252/Cf) is 3,749 +- 0,016. An analysis of the results and methods of californium-252 half-life measurement has been carried out. The value T=(2,6473 +- 0,0028) years can be recommended as evaluated by the results of the considered publications. 23 refs, 2 figs.

50580 (INIS-BR—681) **Absolute measurements of the alpha-gamma emitters activities by a sum-coincidence method.** Tobias, C.C.B. (Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1982. 103p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. File Number DE87703441.

The absolute activity of U-235 contained in a UO/sub 2/ sample, using a sum-coincidence circuit which selected only the alpha particles which were simultaneous with the well known 184 Kev gamma radiation from Th-231. The alpha particles were detected by ZnS(Ag) scintillator specially designed to show its maximun efficiency for U-235 alpha particles, whereas the gamma radiation was detected by NaI(Tl) scintillation detector. The values obtained for the half-life of U-235 was compared with data from various observers using different experimental techniques.

50581 (INIS-BR—682) **Measurements of the effective range of fission fragments in UO/sub 2/ and the disintegration constant for spontaneous fission of /sup 238/U.** Spaggiari, E.R.V. (Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1978. 119p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. File Number DE87703442.

The results of measuments of the disintegration constant for spontaneous fission in /sup 238/U are presented, with a discussion on the method used for the detection of fission tracks in muscovite mica. Samples of muscovite mica sandwiched between two natural uranium dioxide cylinders were irradiated with fragments of spontaneous fission and the etched tracks counted with projection optical microscope. The effective thickness of the UO/sub 2/ layer which contributed to the observed tracks was measured through irradiation of mica samples, in contact with the UO/sub 2/ cylinder with 14,0 MeV neutrons from a (d,t) reaction.

50582 (INIS-BR—684) **Measurement of the absolute activity of alpha or beta emitters by measuring product nuclei (daughter) activity increase or by studying its radioactive decay.** Campos, L.C. de. (Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1981. 132p. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703444.

A new method for determining absolute activity of alpha or beta emitters by measuring daughter product radioactive decay is presented. The separation method of UX from hexahydrated uranyl nitrate UO/sub 2/(NO/sub 3/)/sub 2/ 6H/sub 2/O based on its dissolution in ethyl ether is described and the accuracy of this method is shown. The factors which accuate on total efficiency of a Geiger Mueller detector for beta particles are determined. The possibility to determine the mass of precursor element by daughter nuclei activity is shown. The results are compared with the one obtained by direct measurement of the mass (or number of atoms) of precursor radioactive substance and with theoretical values calculated for isotopes in secular equilibrium.

50583 (INIS-BR—688, pp 150) **Possibility of the occurrence of the M1 component in the /sup 235/U photofission.** Carvalheiro, Z.; Simionatto, S.; Herdade, S.B.; Arruda Neto, J.D.T. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50584 (INIS-BR—688, pp 162) **Photofission of /sup 237/Np.** Martins, M.C.P.; Arruda Neto, J.D.T.; Paschoal, S.L.; Herdade, S.B. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50585 (INIS-BR—688, pp 170) **Electrofission of /sup 237/Np.** Paschoal, S.L.; Herdade, S.B.; Arruda Neto, J.D.T.; Martins, M.C.P. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50586 (INIS-BR—837, pp 15) **Carbon 14 emission decay of the radium and radon isotopes.** Carvalho, H.G. de; Martins, J.B.; Tavares, O.A.P. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50587 (INIS-BR—837, pp 35) **Study of channels of giant electric quadrupole resonance decay in /sup 238/U.** Gerab, F.; Martins, M.N.; Wolynec, E. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50588 **Improvements at JOSEF and a new setup for fission-product spectroscopy.** Borgs, J.W.; Kohl, H.P.; Lhersonneau, G.; Ohm, H.; Paffrath, U.; Sistemich, K.; Weiler, D.; Meyer, R.A. (Institut fur Kernphysik, Kernforschungsanlage Julich, D-5170 Julich). pp 304-308 of Electromagnetic isotope separators and techniques related to their applications. Talbert, W.L. New York, NY; Elsevier Science Pub. Co. Inc. (1987). (CONF-860815—).

From 11. international conference on electromagnetic isotope separators and techniques related to their applications; Los Alamos, NM, USA (18 Aug 1986).

The intensity of fission products with masses between 100 and 110 has been strongly increased through the use of /sup 239/Pu targets in the gas-filled separator JOSEF. It is now possible to study the new region of deformed nuclei at A $\sim$ 100 in more detail and, in particular, to investigate the structure of nuclei with N > 63. The mass and nuclear charge resolutions of JOSEF for the Mo and Tc isotopes is equal to that observed with /sup 235/U targets for fission products with lower Z. An improved level scheme for /sup 107/Tc is shown as an example for the information which can be obtained with /sup 239/Pu. An electrostatic chopper at JOSEF allows the study even of ms isomers among the fission products. It has been used to determine the half-life of a three-quasi particle state in /sup 97/Y which provides evidence for the strength of the N = 56 subshell. Additionally, with the use of the chopper the ambiguities could be removed concerning the life-time of the 1676 keV state in /sup 131/Sb which according to the new results probably has the character [πg/sub 7/2/ circle times 7/sup -/]15/2/sup -/. A setup for the study of prompt electromagnetic radiation from fission products has been installed at an external beam of thermal neutrons at the research reactor DIDO of the Kernforschungsanlage Julich. It is used for the study of the deexcitation of the neutron-rich nuclei in a time range which is not covered by JOSEF with its separation time of about 1 μs. This allows the investigation of levels with higher spins are usually fed in the β/sup -/ decay of fission products.

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 50436, 50453, 50485, 50486, 50510, 50510, 50572, 50573, 50848

50589 **(ATOMKI-A—17-1987) Selected aspects of light heavy-ion resonances.** Cseh, J. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1987. 15p. (CONF-870177—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700103.

From 5. Oaxtepec nuclear physics symposium; Oaxtepec, Mexico (5 Jan 1987).

The problems of the phenomenological analysis of experimental data of light heavy ion resonance are discussed in detail. The quantitative methods of decomposition of the intermediate structure into single states are worked out and illustrated. The alpha strength functions are calculated based on the collected resonance data of elastic alpha scatterings. Further cluster and quasimolecular states are described as well. The other discussed problem is the algebraic description of the quasimolecular resonances by collective degrees of freedom. As an example C-12 and C-12 resonances are analyzed in terms of dipole and quadrupole interacting bosons. (D.Gy.). 35 refs.; 3 figs.

50590 **(ATOMKI-A—19-1987) Quark effects in nuclear structure.** Arvay, Z. (Magyar Tudomanyos Akademia, Debrecen. Atommag Kutato Intezete). 1987. 8p. (CONF-8606130—14). NTIS (US Sales Only), PC A02/MF A01. File Number DE88700105.

From International conference on nuclear structure, reactions, and symmetries; Dubrovnik, Yugoslavia (5 Jun 1986).

A hybrid-model is presented which takes into account the quark and meson degrees of freedom in the description of nuclear structure of a system with j/sup 2/ configuration coupled to I=0 total angular momentum. As an application of the model the radius of the nucleon described as a 3-quark cluster has been calculated to be 0.44 fm in agreement with the little-bag model. It was determined by evaluating a residual interaction matrix element constructed on the basis of QCD assumptions and relating it to the value extracted from experimental nuclear data. 18 refs.

50591 **(BNL—40147) The (γ,K) program: A new CEBAF initiative for the study of nuclear strangeness.** Chrien, R.E.; Hungerford, E.V. (Brookhaven National Lab., Upton, NY (USA); Houston Univ., TX (USA)). Jun 1987. Contract AC02-76CH00016. 16p. (CONF-8706200—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014392.

From CEBAF summer workshop; Newport News, VA, USA (22 Jun 1987).

This paper is a summary of the CEBAF working group discussions on electromagnetic production of strangeness in nuclear systems. A review of the recent BNL results in (π,K) is presented as representative of the physics questions that could be addressed with the CEBAF facility. Recommendations of the working group concerning the necessary experimental apparatus for a (e,e',K) program are presented. 13 figs., 2 tabs.

50592 **(BNL—40216) Nuclear beta decay after Les Houches.** Warburton, E.K. (Brookhaven National Lab., Upton, NY (USA)). 1987. Contract AC02-76CH00016. 9p. (CONF-870909—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014921.

From Conference on nuclear interactions and structures; Brighton, UK (7 Sep 1987).

Wilkinson's 1977 Les Houches lectures summarized in detail how nuclear beta decay can be used to investigate fundamental nuclear phenomena and the achievements of this utilization up to that time. In this short talk the subsequent activity is briefly summarized and one area of high activity, namely first-forbidden beta decay, is singled out for more lengthy discussion. Specifically, the subject of interest is the very large meson exchange contribution to the time-like component of the axial current and the efforts to isolate this enhancement by means of careful shell-model calculations. 19 refs., 4 figs., 2 tabs.

50593 (IAEA-TECDOC—410, pp 144-152) **Theoretical description of the Cf-252 fission neutron spectrum.** Maerten, H. (Technische Univ., Dresden, German Democratic Republic). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Starting with a characterization of the fission process related to fission neutron emission and corresponding theoretical concepts this review considers basic principles of a statistical-model approach to fission neutron spectra based on the assumption that all prompt fission neutrons are evaporated from fully accelerated fragments. Further possible emission mechanisms are discussed. Recent

theoretical descriptions of the Cf-252 (sf) neutron spectrum are summarized focusing on emission models (statistical formalism) as well as on the procurement of necessary fragment data. The present status of fission theory concerning the prediction of fragment distributions in nucleon numbers N, Z, kinetic energy E/sub k/, excitation energy E/sup x/, and spin I is evaluated. Finally this review characterizes the applicability of the different fission neutron emission models considered to any fission reaction as well as their accuracy discussed on the basis of the Cf-252(sf) neutron spectrum calculation. 54 refs, 3 figs.

50594 (IAEA-TECDOC—410, pp 153-158) **Calculation of prompt fission neutron spectra for applied purposes.** Maerten, H.; Ruben, A.; Seeliger, D. (Technische Univ., Dresden, German Democratic Republic). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

An extended version of the generalized Madland-Nix model is used to calculate the energy spectrum of fission neutrons as well as multi-differential emission probabilities (energy and angular distributions for different fragment mass numbers A). Besides the consideration of the compound-nucleus formation cross-section and the model dependence on A we introduce the center-of-mass system (CMS) anisotropy of neutron emission and a definite lower limit of the temperature distribution to account for the influence of neutron-gamma competition roughly. Fission energetics are studied in the framework of a simple two-spheroid model including shell correction energy. This treatment can be used to deduce necessary fragment data for any fission reaction semi-empirically. The new fission neutron spectrum model is applied to the spontaneous fission of /sup 252/Cf. 20 refs, 3 figs.

50595 (IAEA-TECDOC—410, pp 158-171) **Evaluation of the Cf-252 fission neutron spectrum between 0 MeV and 20 MeV.** Mannhart, W. (Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, F.R.). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The results of seven recent measurements of the Cf-252 neutron spectrum were used in the evaluation. Based on the available information, for each experiment a complete uncertainty covariance matrix was generated. The data were combined by generalized least-squares techniques. The evaluation was carried out with 70 energy grid points between 25 keV and 19.8 MeV. The individual experimental data were extrapolated to these grid points by using the shape of a Maxwellian distribution specific for each experiment. The evaluation gave a value of chi/sup 2/ per degree of freedom of approximately unity and indicated no incompatibility between the experiments. The resulting relative uncertainty of the evaluation is smaller than 2% between 180 keV and 9.3 MeV. A weighted spline interpolation between the discrete data points was used to generate a continuous shape of the evaluated neutron spectrum. The result of the evaluation was compared with available theoretical descriptions of the Cf-252 neutron spectrum. None of the existing theories is compatible with the evaluation over the whole energy range. 23 refs, 18 figs, 4 tabs.

50596 (IAEA-TECDOC—410, pp 208-212) **Theoretical calculations of prompt neutron spectrum for Cf-252 spontaneous fission.** Gerasimenko, B.F.; Rubchenya, V.A. (Radievyj Inst., Leningrad, USSR). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

The results of theoretical calculations of prompt neutron spectra and multiplicity distributions for /sup 252/Cf spontaneous fission are reported. The calculations were carried out on the basis of Hauser-Feshbach statistical theory taking into consideration the angular anisotropy of neutron emission in the center-of-mass system of fragment and ignoring it. Nonequilibrium component was neglected in calculations. The theoretical results are compared with experimental ones. The effects of input data uncertainty and angular anisotropy consideration on the calculation results are discussed. 16 refs, 3 figs, 1 tab.

50597 **(IFUSP-P—566) Isospin mixing in compound nuclear reactions: a study in the /sup 11/B(p,n)/sup 11/C system at Ep = 14.3 MeV.** Hussein, M.S.; Pessoa, E.F.; Schelin, H.R.; Douglas, R.A. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Jan 1986. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703415.

The elastic enhancement factor in charge exchange reactions proceeding via the compound nucleus, predicted to attain the value of 2 in the weak isospin mixing regime, is tested in the system /sup 11/B(p,n)/sup 11/C at <Ep> = 14.3 Mev. Both the DWBA and Hauser-Feshbach calculations employed in the analysis are used in a way which physically simulates a two coupled-channels model. Our results show an enhancement factor larger than 1 indicating that isospin is mainly conserved in this reaction.

50598 **(IFUSP-P—568) Semi microscopic description of /sup 84/Kr.** Dias, H.; Krmpotic, F.; Losano, L.; Mastroleo, R.C. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Feb 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703417.

The experimental information on the /sup 84/Kr nuclei is compared with the model calculation in which two neutron holes are coupled to the vibrational field. Based on the lower-order terms of a perturbative expansion of the E2 and M1 transition matrix elements, a simple rule is obtained for the sign and the magnitude of the δ (E2/M1) ratios for the transitions between the second and first 2/sup +/ states in some vibrational nuclei.

50599 **(IFUSP-P—569) Statistical decay of giant resonances.** Dias, H.; Teruya, N.; Wolynec, E. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Feb 1986. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703418.

Statistical calculations to predict the neutron spectrum resulting from the decay of Giant Resonances are discussed. The dependence of the results on the optical potential parametrization and on the level density of the residual nucleus is assessed. A Hauser-Feshbach calculation is performed for the decay of the monopole giant resonance in /sup 208/Pb using the experimental levels of /sup 207/Pb from a recent compilation. The calculated statistical decay is in excellent agreement with recent experimental data, showing that decay of this resonance is dominantly statistical, as predicted by continuum RPA calculations.

50600 **(IFUSP-P—571) Kinetic description of the total photoabsorption cross section: correlation effects.** Ferreira Filho, L.G.; Nemes, M.C. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Feb 1986. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703419.

It is shown that the inclusion of correlation effects in describing the nuclear photoabsorption cross section leads to a Breit-Wigner type curve with energy dependent width. It is also shown that a very slow energy dependence is enough to reproduce the data up to — 139 MeV.

50601 **(IFUSP-P—573) Direct and statistical gamma decay of the giant quadrupole resonance of /sup 208/Pb.** Dias, H.; Hussein, M.S.; Carlson, B.V.; Merchant, A.C. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Mar 1986. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703421.

The gamma decay of the giant quadrupole resonance of /sup 208/Pb is discussed. The relative contribution of the decay via the compound nucleus is calculated from the statistical theory. It is found that the compound decay is as important as the direct decay.

50602 **(IFUSP-P—580) New estimate of triton asymptotic normalizations.** Frederico, T.; Adhikari, S.K.; Hussein, M.S. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Apr 1986. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703424.

The role of deuteron asymptotic D to S normalization rati eta/sup D/ on the calculation of triton observables is emphasized.

Studying the new correlations among triton asymptotic normalizations and eta/sup D/ a new estimate of triton asymptotic normalizations C/sub S/ and C/sub D/ is made: C/sub zeta/=1.85 +- 0.04, C/sub D//C/sub S/=0.0463 +- 0.0013, for eta/sup D/ =0.0271 (4), and C/sub D//C/sub S/ eta/sup D/=1.71 +- 0.04.

50603 **(IFUSP-P—581) Fission decay properties of nuclear giant multipole resonances.** Dias, H.; Arruda Neto, J.D.T.; Hussein, M.S.; Carlson, B.V. (Sao Paulo Univ. (Brazil). Inst. de Fisica). May 1986. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703425.

The statistical fission decay properties of the giant dipole, quadrupole and monopole resonances in /sup 236/U are investigated with the aid of the Hauser-Feshbach model. It is found, contrary to several recent claims, that the GQR fission decay probability is as large as that of the GDR, at energies higher than the fission barrier. At energies close to the f.b., the GQR fission probability is found to be appreciably larger than that of the GDR. The GMR fission probability follows closely that of the GQR.

50604 **(IFUSP-P—583) Microscopic multiple scattering theory of the heavy ion total reaction cross section.** Hussein, M.S.; Rego, R.A. (Sao Paulo Univ. (Brazil). Inst. de Fisica). May 1986. 62p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87703426.

The multiple scattering theory is used to develop a theoretical framework for the calculation of the heavy-ion total reaction cross section. Several important medium effects such as Pauli blocking, are included. The second order double scattering contribution to the ion-ion 'trho/sub 1/rho/sub 2/' interaction is calculated and found to contribute at most 10% effect on σ/sub R/. It is found that whereas at intermediate energies the 'trho/sub 1/rho/sub 2/' accounts reasonably well for the total reaction cross section, indicating the predominance, at these energies, of single nucleon knockout, it understimate σ/sub R/ at lower energies by a large amount.

50605 **(IFUSP-P—587) Study of the nuclear photoexitation mechanism near the δ(3,3) resonance using fission.** Arruda Neto, J.D.T. (Sao Paulo Univ. (Brazil). Inst. de Fisica). 1986. 11p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703428.

From the photoabsorption cross-section of complex nuclei, information can be obtained concerning the influence of nuclear matter on the photoproduction of pions and the role played by the dynamics of Δ propagation in the nucleous. The energy region below the Δ resonance peak (300 MeV) is poorly known and requires that many more measurements be performed. In this work, experimental results and conclusions of the study of a heavy nucleous, /sup 209/Bi, excited by virtual photons in the energy region near the Δ resonance peak is presented. The absolute electrofission cross-section δ/sub e,f/ (Ee) has been measured for electrons with energies in the range 43 to 90 MeV in 5 MeV wide steps , with a fixed resolution of 2,0%. (S.D.).

50606 **(IFUSP-P—591) Nuclear matter kinetic coefficients and damping of finite nuclear collective modes.** Toledo Piza, A.F.R. de. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Jun 1986. 8p. (CONF-8606208—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703430.

From 9. workshop on nuclear physics; Buenos Aires, Argentina (23 Jun 1986).

By carrying the general description of one-body observables beyond the mean-field approximation, those correlation terms responsible for Kinetic phenomena and those involved in the renormalization of the G-matrix mean-field in finite nuclei are identified. A kinetic equation for the one-body density is obtained. Estimates for transport coefficients and for the damping of zero sound are obtained which point to the inadequacy of hydrodynamical descriptions of collective nuclear modes and indicate that collisional damping in large nuclei may account for one or a few tenths of the observed widths. (S.D.).

50607 **(IFUSP-P—595) Direct vs statistical decay of nuclear giant multipole resonances.** Hussein, M.S. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Jul 1986. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703431.

A theoretical framework for the description of the decay of giant multipole resonances is developed. Besides the direct decay, both the pre-equilibrium and statistical (compound) decays are taken into account in a consistent way. It is shown that the statistical decay of the GR is not necessarily correctly described by the Hauser-Feshbach theory owing to the presence of a mixing parameter, which measures the degree of fragmentation. Applications are made to several cases.

50608 **(IFUSP-P—615) Hybrid model for the decay of nuclear giant resonances.** Hussein, M.S. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Dec 1986. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703432.

The decay properties of nuclear giant multipole resonances are discussed within a hybrid model that incorporates, in a unitary consistent way, both the coherent and statistical features. It is suggested that the 'direct' decay of the GR is described with continuum first RPA and the statistical decay calculated with a modified Hauser-Feshbach model. Application is made to the decay of the giant monopole resonance in /sup 208/Pb. Suggestions are made concerning the calculation of the mixing parameter using the statistical properties of the shell model eigenstates at high excitation energies.

50609 **(INIS-BR—688) Proceedings of the 7. Workshop on Nuclear Physics.** (Sociedade Brasileira de Fisica, Rio de Janeiro). 1984. 277p. (In several languages). (CONF-8409401—). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448.

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

The courses, seminaries and contributions of the 7.Work Meeting on Nuclear Physics are presented. In the courses and seminaries parts, a method to solve nuclear systems, the present stage of development of heavy ions reactions at high energies, the project and experiences for accelerators, in addition to, some important topics on tokamaks are presented. In the part of contributions, the theoretical and experimental results of reactions with light and heavy ions involving high energies, the studies of nuclear phenomena and techniques for improving instruments of radiation detection are presented. (M.C.K.).

50610 (INIS-BR—688, pp 74) **Relativistic nuclear reactions.** Nazareth, R.A.M.S. (Rio de Janeiro Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

The status of development of theoretical and experimental researches in relativistic nuclear reaction field is presented. Two categories of theoretical models are distinguished: the models developed to explain the experimental data for relativistic nuclear reactions with incident energies on the order of 1 GeV/A; and models developed for ultrarelativistic nuclear reactions with incident energy on the order of 10 GeV/A to promote a possible phase transition in quark and gluon plasma. In relativistic nuclear reaction category the intranuclear cascade model is presented where the importance of correlations of some particles in the nuclear collision process is discussed. With regard to ultrarelativistic nuclear reaction some fundamental concepts, important for studying heavy ion collisions at ultrarelativistic energy are discussed. (M.C.K.).

50611 (INIS-BR—688, pp 184) **Experimental investigation of the nuclear glory effect.** Villari, A.C.C.; Portezan Filho, O.; Lepine-Szily, A.; Lichtenthaler Filho, R.; Fernandes, M.A.G.; Rotberg, V.H.; Cunha, J.W.S.D. da. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50612 (INIS-BR—688, pp 193) **Performance of the peripheric partial waves in anomalous open angle scattering in collisions between n-α type nuclei.** Aleixo, A.N.F.; Canto, L.F.U.; Carrilho, P.; Hussein, M.S. (Rio de Janeiro Univ., Brazil. Inst. de Fisica; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50613 (INIS-BR—688, pp 225) **Symplectic model of monopolar oscillations.** Oliveira, M.M.B.M.; Passos, E.J.V. de. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50614 (INIS-BR—688, pp 202) **Statical decay of giant monopole resonance in the /sup 208/Pb.** Dias, H.; Wolynec, E. (Universidade Federal Fluminense, Niteroi, Brazil. Inst. de Fisica; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50615 (INIS-BR—688, pp 204) **Statical decay of giant electric dipole resonance in the /sup 208/Pb.** Dias, H.; Wolynec, E. (Universidade Federal Fluminense, Niteroi, Brazil. Inst. de Fisica; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50616 (INIS-BR—688, pp 216) **Quasicluster-vibrator coupling applied to the Zn odd isotopes.** Losano, L.; Dias, H. (Sao Paulo Univ., Brazil. Inst. de Fisica; Universidade Federal Fluminense, Niteroi, Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50617 (INIS-BR—688, pp 218) **Shell model and the bag model.** Maris, T.A.J.; Krein, G.I. (Rio Grande do Sul Univ., Porto Alegre, Brazil). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50618 (INIS-BR—688, pp 218) **Study of the /sup 84/Kr nuclear structure by unified model.** Mastroleo, R.C.; Dias, H.; Krmpotic, F. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Universidade Federal Fluminense, Niteroi, Brazil. Inst. de Fisica; La Plata Univ. Nacional, Argentina. Facultad de Ciencias Exactas). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50619 (INIS-BR—688, pp 228) **Electromagnetic moments in the tin isotopes.** Rabello Junior, N.; Miyake, H. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50620 (INIS-BR—688, pp 229) **M1 transitions in the Ca isotopes.** Salvetti, A.R.; Toledo Piza, A.F.R. de. (Mato Grosso do Sul Univ., Campo Grande, Brazil. Dept. de Fisica e Quimica; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50621 (INIS-BR—688, pp 230) **Calculations of multipolar mixtures (E2/M1) by quasi-particle-vibrator coupling model for the /sup 127/Te and /sup 129/Te nucleus.** Souza, M.O.M.D. de; Dias, H.; Saxena, R.N. (Sao Carlos Univ., Brazil; Universidade Federal Fluminense, Niteroi, Brazil; Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50622 (INIS-BR—688, pp 197) **Multiple stage fusion models for heavy ions.** Carlson, B.V.; Civitarese, O.; Hussein, M.S.; Toledo, A.S. de. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil; La Plata Univ. Nacional, Argentina; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50623 (INIS-BR—688, pp 207) **Polarization in the n-p elastic scattering.** Frederico, T.; Lejbman, I.D.G. vel. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50624 (INIS-BR—688, pp 213) **Inclusive fragmentation in the light and heavy ion reactions with E/N or approx. 20 MeV.** Hussein, M.S.; Mastroleo, R.C. (Sao Paulo Univ., Brazil. Inst. de Fisica; Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50625 (INIS-BR—688, pp 215) **Semiclassical theory with absorption.** Hussein, M.S.; Pato, M.P. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50626 (INIS-BR—688, pp 223) **Monte Carlo type simulation of the carbon fragmentation at high energy.** Moeller, E.; Nemes, M.C.; Gross, D.H.E. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H., Germany, F.R.). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50627 **(INIS-BR—714) Proceedings of the 2. Nuclear Physics Session of the Jorge Andre Swieca Summer School. Vol. 1.** (Sociedade Brasileira de Fisica, Rio de Janeiro). 1 Aug 1985. 323p. (In Portuguese). (CONF-8502157—Vol.1). NTIS (US Sales Only), PC A14/MF A01. File Number DE87703466.

From 2. nuclear physics session of the Jorge Andre Swieca summer school; Rio de Janeiro, RJ, Brazil (1 Feb 1985).

Several lectures on the field of Nuclear Physics are presented in a pedagogical way. In all of them an introduction is given, mainly on the basis of Quantum Mechanics and Elementary Particles. Whenever is possible the models are compared with the available experimental data. (L.C.).

50628 (INIS-BR—714, pp 121-206) **Electron scattering and nuclear structure.** Wolynec, E. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1 Aug 1985. (In Portuguese). NTIS (US Sales Only), PC A14/MF A01. File Number DE87703466. (CONF-8502157—Vol.1).

From 2. nuclear physics session of the Jorge Andre Swieca summer school; Rio de Janeiro, RJ, Brazil (1 Feb 1985).

A review of the historical development and the theory necessary to the interpretation of the experimental results is made. Some measurement techniques, experimental results and the technique of analysis of these data are presented. Future perspectives, due to the appearence of continous electron current accelerators, in this field of study are discussed. (L.C.).

50629 (INIS-BR—714, pp 3-74) **Heavy ion fragmentation in high energy.** Nemes, M.C. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1 Aug 1985. (In Portuguese). NTIS (US Sales Only), PC A14/MF A01. File Number DE87703466. (CONF-8502157—Vol.1).

From 2. nuclear physics session of the Jorge Andre Swieca summer school; Rio de Janeiro, RJ, Brazil (1 Feb 1985).

A review is made on the theoretical aspects of heavy ion collisions at high energies. A comparison with several experimental data obtained in a large variety of experiments is present. An emphasis is given on the basis of Glauber's theory of scattering. (L.C.).

50630 (INIS-BR—714, pp 75-120) **Introduction to the nuclear physics at very high energy.** Kodama, T. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1 Aug 1985. (In Portuguese). NTIS (US Sales Only), PC A14/MF A01. File Number DE87703466. (CONF-8502157—Vol.1).

From 2. nuclear physics session of the Jorge Andre Swieca summer school; Rio de Janeiro, RJ, Brazil (1 Feb 1985).

An introduction to the nuclear physics at very high energies on the basis of relativistic nucleus-nucleus, hadron-nucleus and hadron-hadron collisions is made. Some theoretical models used nowadays to explain the experimental data, such as Quantum Chromodynamics, String Model, etc... are presented. (L.C.).

50631 (INIS-BR—714, pp 289-320) **Pre-equilibrium reactions.** Hussein, M.S. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1 Aug 1985. (In Portuguese). NTIS (US Sales Only), PC A14/MF A01. File Number DE87703466. (CONF-8502157—Vol.1).

From 2. nuclear physics session of the Jorge Andre Swieca summer school; Rio de Janeiro, RJ, Brazil (1 Feb 1985).

Some basic characteristics of pre-equilibrium reactions (10/sup -23/S < t/sub reaction/ < 10/sup -18/s) are reviewed on the basis of some statistical models. (L.C.).

50632 **(INIS-BR—746) Proceedings of the 5. National Meeting on Intermediate Energy Physics.** (Rio Grande do Sul Univ., Porto Alegre (Brazil). Inst. de Fisica). May 1984. 400p. (In Portuguese). (CONF-8405363—). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498.

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

Several papers concerning the physics at intermediate energies (— 100-1000MeV) are presented in this proceedings. Almost all the works show overlapping between Nuclear and Particles Physics. There is a predominance in theoretical papers. (L.C.).

50633 (INIS-BR—746, pp 1-11) **Bags and the shell model.** Maris, T.A.J. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

Some problems and features of shell and bag models for Nuclear Physics are reviewed. Besides the compatibility of the two models is discussed. (L.C.).

50634 (INIS-BR—746, pp 29-44) **Nuclear surface vibrations in bag models.** Tomio, L. (Pernambuco Univ., Recife, Brazil. Dept. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The main difficulties found in the hadron bag models are reviewed from the original version of the MIT bag model. Following, with the aim to answer two of the main difficulties in bag models, viz., the parity and the divergence illness, a dynamical model is presented. In the model, the confinement surface of the quarks (bag) is treated like a real physical object which interacts with the quarks and is exposed to vibrations. The model is applied to the nucleon, being observed that his spectrum, in the first excited levels, can be reproduced with resonable precision and obeying to the correct parity order. In the same way that in a similar work of Brown et al., it is observed to be instrumental the inclusion of the effect due to pions. (L.C.).

50635 (INIS-BR—746, pp 219-226) **Nuclear shell model and the bag model.** Krein, G.I. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

For a fermi-sea of bag-nucleons, the quark statistics leads to corrections which grow with the bag radius. The influence of this effect on the single-particle nature of the sea is estimated.

50636 (INIS-BR—746, pp 292-300) **Nuclear potentials due to pion exchange.** Robillota, M.R. (Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The two, three and four nucleon potentials due to the exchange of pions can be accurately calculated by means of chiral symmetry. The comparison of the dynamical content of these potentials allow us to understand the geometrical origin of the hierarchy existing among them.

50637 (INIS-BR—746, pp 359-372) **Effective polarization in quasi-free scattering and nuclear structure.** Vasconcellos, C.A.Z.; Maris, T.A.J.; Schneider, C. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

Theoretical predictions which have been experimentally confirmed have shown that the nucleon which is knocked-out in quasi-free scattering was in general polarized in the nucleus. This polarization which can be nearly complete, depends strongly on the structure of the inital and residual nuclei. Measurements of this polarization may therefore be used to discriminate between different models of these states. The effective polarization for the [jj] coupled shell model, [LS] coupling and a deuteron cluster model is calculated. The calculated polarizations for these cases are very different, occasionally even in sign.

50638 (INIS-BR—746, pp 206-217) **Lifetime of a nuclear hole state in a field theoretic model.** Steffani, M.H.; Betz, M.; Maris, T.A.J. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The lifetime of a hole state created in a quasi-free experiment is calculated in a field-theoretic model of nuclear matter. The imaginary parts of the direct and exchange terms of the self-energy are discussed.

50639 (INIS-BR—746, pp 134-158) **Intermediate energy nucleon-nucleus total reaction cross section in the Dirac phenomenology.** Carlson, B.V.; Isidro Filho, M.P.; Hussein, M.S. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The total reaction cross section for intermediate energy nucleon-nucleus scattering systems is calculated within the Dirac-eikonal formalism. Comparison with data indicates that the recently proposed impulse-approximation Dirac optical potential for nucleon-nucleus scatteting is not absorptive enough.

50640 (INIS-BR—746, pp 257-291) **Photonuclear physics at intermediate energies.** Arruda Neto, J.D.T. (Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

A review and a description of the state of the art in the field of photonuclear reactions is given. Future perspectives for works in this area in the linear accelarator laboratory at USP, Brazil are presented. (L.C.).

50641 (INIS-BR—746, pp 381-387) **Photonuclear reactions at intermediate energies.** Martins, J.B. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). May 1984. (In Portuguese). NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The specification of the ALFA 3 project of the Frascati National Laboratory, Italy, used for photonuclear reactions at intermediate energies are presented. (L.C.).

50642 (INIS-BR—837) **Proceedings of the 9. Workshop on Nuclear Physics - Communications of basic nuclear physics.** (Sociedade Brasileira de Fisica, Rio de Janeiro). 1986. 148p. (In Portuguese). (CONF-8608195—Pt.1). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733.

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The abstracts of researches on basic nuclear physics of 9. Workshop on Nuclear Physics in Brazil are presented. Mathematical models and experimental methods for nuclear phenomenon description, such as nuclear excitation and disintegration of several nuclei were discussed. (M.C.K.).

50643 (INIS-BR—837, pp 89) **Statistical properties of the nuclear shell-model Hamiltonian.** Dias, H.; Hussein, M.S.; Oliveira, N.A. de; Wildenthal, B.H. (Sao Paulo Univ., Brazil. Inst. de Fisica; Drexel Univ., Philadelphia, PA, USA). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The statistical properties of realistic nuclear shell-model Hamiltonian are investigated in sd-shell nuclei. The probability distribution of the basic-vector amplitude is calculated and compared with the Porter-Thomas distribution. Relevance of the results to the calculation of the giant resonance mixing parameter is pointed out.

50644 (INIS-BR—837, pp 93) **Density of particle-hole states.** Carlson, B.V.; Merchant, A.C. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50645 (INIS-BR—837, pp 96) **Limiting total excitation energy of the nucleus and Levinson's theorem.** Almeida, F.I.; Yuen, C.; Hussein, M.S. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The limiting total excitation energy of /sup 208/Pb is calculated using the nuclear grand partition function. A temperature dependent shell-model potential and an energy-dependent nucleon-nucleus optical potential are employed to generate the T-dependent bound single particle energies ϵ/sub K/ and the continuun level density rho (ϵ) respectively. Levinson's theorem is used to make the relevant change in rho (ϵ) due to the T-dependence of ϵ/sub K/ (T). Preliminary numerical results have been obtained.

50646 (INIS-BR—837, pp 101) **Temporal evolution of compound nuclei.** Carlson, B.V. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50647 (INIS-BR—837, pp 124) **Energy of semiclassical correlation in symmetric finite nuclei.** Nielsen, M.; Toledo Piza, A.F.R. de. (Pontificia Univ. Catolica de Sao Paulo, Brazil. Dept. de Fisica; Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50648 (INIS-BR—837, pp 128) **Formalism of good isospin for isovectorial excitations.** Galeao, A.P.N.R.; Passos, E.J.V. de; Menezes, D.P. (UNESP, Rio Claro, Brazil. Inst. de Geociencias e Ciencias Exatas; Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50649 (INIS-BR—837, pp 130) **Self consistent description of out Yrast line states.** Kyotoku, M.; Schmid, K.W.; Faessler, A.; Gruemmer, F. (Paraiba Univ., Joao Pessoa, Brazil. Dept. de Fisica; Tuebingen Univ., Germany, F.R. Inst. fuer Theoretische Physik; Kernforschungsanlage Juelich G.m.b.H., Germany, F.R. Inst. fuer Kernphysik). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50650 (INIS-BR—837, pp 121) **Correlations of high order in the polarization propagator of spin/isospin excitations.** Salvetti, A.R.; Toledo Piza, A.F.R. de. (Mato Grosso do Sul Univ., Campo Grande, Brazil. Dept. de Fisica; Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50651 (INIS-BR—837, pp 139) **New estimate of triton asymptotic normalizations.** Frederico, T.; Adhikari, S.K.; Hussein, M.S. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Pernambuco Univ., Recife, Brazil; Sao Paulo Univ., Brazil). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50652 (INIS-BR—837, pp 142) **Two-pion exchange three-nucleon potential in the trinucleon system.** Battistel, O.A.; Coelho, H.T.; Robillota, M.R. (Pernambuco Univ., Recife, Brazil. Dept. de Fisica; Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50653 (INIS-BR—837, pp 144) **Bag overlap and Coulomb sum rule.** Krein, G. (Santa Maria Univ., Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50654 (INIS-BR—837, pp 21) **Global study of optical theorem for heavy ion system.** Villari, A.C.C.; Lepine-Szily, A.; Lichtenthaler Filho, R.; Portezan Filho, O.; Oliveira Junior, J.M.; Obuti, M.M.; Added, N. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50655 (INIS-BR—837, pp 42) **Simple model for studying time of heavy ion fusion reaction at low energies.** Revollo, F.R.A. (Universidade Estadual de Londrina, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50656 (INIS-BR—837, pp 50) **Relativistic Coulomb excitation for nuclear collisions.** Galetti, D.; Kodama, T.; Nemes, M.C. 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50657 (INIS-BR—837, pp 53) **Calculation of intranuclear cascade and pion production in relativistic nuclear collisions.** Medeiros, E.L.; Kodama, T.; Duarte, S.J.B. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro; Lawrence Berkeley Lab., CA, USA). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50658 (INIS-BR—837, pp 57) **Method of dispersion relation in heavy ion fusion reactions below barrier.** Franzin, V.L.M.; Hussein, M.S. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

Heavy ion fusion reaction below barrier, using an inverse dispersion relation, which provides the imaginary part of inclusive fusion polarization potential (PPFI) in terms of the principal part of integral which involves the real part of PPFI. The /sup 16/O +/ sup A/Sm system is done as an example. The reactive content of extracted PPFI is analysed within coupled channel theory. (M.C.K.).

50659 (INIS-BR—837, pp 65) **Diagonalization of a non-gaussian overlap in generator coordinate method.** Moraes, M.M.W. de; Toledo Piza, A.F.R. de. 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50660 (INIS-BR—837, pp 104) **SAM revisited: uniform semiclassical approximation with absorption.** Hussein, M.S.; Pato, M.P. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The uniform semiclassical approximation is modified to take into account strong absorption. The resulting theory, very similar to the one developed by Frahn and Gross is used to discuss heavy-ion elastic scattering at intermediate energies. The theory permits a reasonably unambiguos separation of refractive and diffractive effects. The systems /sup 12/C+/sup 12/C and /sup 12/C+/sup 16/O, which seem to exhibit a remnant of a nuclear rainbow at E=20 Mev/N, are analysed with theory which is built directly on a model for the S-matrix. Simple relations between the fit S-matrix and the underlying complex potential are derived.

50661 (INIS-BR—837, pp 108) **Elastic enhancement factor in the /sup 11/B(p,n) /sup 11/C reaction at Ep=14.3MeV.** Hussein, M.S.; Pessoa, E.F.; Schelin, H.R.; Carlson, B.V.; Douglas, R.A. (Sao Paulo Univ., Brazil. Inst. de Fisica; Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Universidade Estadual de Campinas, Brazil. Inst. de Fisica). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The /sup 11/B(p,n)/sup 11/C reaction at <Ep>=14.3 MeV is presented to verify the hypothesis that in charge exchange reactions through compound nucleous, they are an enhancement factor close to two over all other inelastic channels if isospin is conserved. The cross sections of energy transitions to the ground state and the first three excited states of /sup 11/C, using the Pelletron accelerator of S.P., in Brazil, were obtained. An analysis of elastic scattering cross sections at <Ep>=13.0 MeV is also presented. (M.C.K.

50662 (INIS-BR—837, pp 133) **Extension of Glauber theory to large angle scattering of "Dirac" protons.** Hussein, M.S.; Marques, G.C.; Spehler, D. (Sao Paulo Univ., Brazil. Inst. de Fisica; Strasbourg-1 Univ., 67, France). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

An extension of symmetrical T-matrix theory for relativistic description of proton-nucleus scattering is presented. The 4 x 4 symmetrix T-matriz is reduced to an effective symmetrix 2 x 2 matriz using projection technique. The resulting non-relativistic looking T-matrix contains relativistic (virtual pain) effects to all orders. Glauber theory is then applied to develop a reasonable approximation which could be valid even at large angles.

50663 (INIS-BR—837, pp 67) **Damping of the giant resonances in a fluid-dynamical model.** Providencia, J. da. (Coimbra Univ., Portugal). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

The relevance to the damping of the giant resonances, of the anharmonic coupling between the normal modes, is investigated in a fluid dynamical mode. It is found that this mechanism leads to a weak damping which, however, increases very drastically with the wavevector, implying a very short life time for high multipolarity modes.

50664 (INIS-BR—837, pp 72) **Direct vs statistical decay of nuclear giant multipole resonances.** Dias, H.; Hussein, M.S.; Carlson, B.V.; Merchant, A.C.; Adhikari, S.K. (Sao Paulo Univ., Brazil. Inst. de Fisica; Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Pernambuco Univ., Recife, Brazil. Dept. de Fisica). 1986. NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

A theoretical framework for the description of the decay of giant multipole resonances id developed. Besides the direct decay, both the pre-equilibrium and statistical (compound) decays are taken into account in a consistent way. It is shown that the statistical decay of the giant resonance is not necessarily described by the Hauser-Feshbach theory owing to the presence of a mixing parameter, which measures the degree of fragmentation. Applications are made to several cases.

50665 (INIS-BR—837, pp 79) **Statistical decay of giant resonances.** Dias, H.; Teruya, N.; Wolynec, E. 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

Statistical calculations to predict the neutron spectrum resulting from the decay of Giant Resonances are discussed. The dependence of the resutls on the optical potential parametrization and on the level density of the residual nucleus is assessed. A Hauser-Feshbach calculation is performed for the decay of the monople giant resonance in /sup 208/Pb using the experimental levels of /sup 207/Pb from a recent compilation. The calculated statistical decay is in excelent agreement with recent experimental data, showing that the decay of this resonance is dominantly statistical, as predicted by continuum RPA calculations.

50666 (INIS-BR—838, pp 73) **Statistical analysis of angular correlation measurements.** Oliveira, R.A.A.M. de; Vanin, V.R. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50667 (JINR-D—4-85-851, pp 83-103) **Damping of giant resonances.** Wambach, J. (Illinois Univ., Urbana, USA. Dept. of Physics). 1985. NTIS (US Sales Only), PC A18/MF A01. File Number DE88780001. (CONF-8510458—).

From International school on nuclear structure; Alushta, Ukrainian SSR (14 Oct 1985).

The microscopic theory of damping phenomena in small amplitude nuclear vibrational motion has been discussed. Because of the long mean free path of nucleons in nuclei, the mean field description in terms of the RPA, provides the appropriate starting point. Since the RPA is equivalent to a collisionless transport theory, damping originates entirely from the energy distribution of single particle orbits in the static mean field ("fragmentation width") and single nucleon emission into the continuum ("escape width"). In light nuclei, this picture seems to be roughly correct. It develops, however, serious deficiencies in heavy nuclei. To improve the theory collisional damping has to be included. Physically collisional damping is introduced by binary interactions of particles moving in the mean field. In the small amplitude limit these collisions result in a direct coupling of the 1p1h excitations to 2p2h excitations. Thus the theory of collisional damping can be formulated as a straightforward extension of the usual RPA to include 1p1h - as well as 2p2h states. The resulting second RPA equations are extremely difficult to solve in heavy nuclei since the shell model spaces become prohibitively large. Based on the full equations essentially two approximation schemes which have both been applied extensively in the literature in the last few years have been discussed. 25 refs.; 14 figs.; 2 tabs.

50668 **(LA-UR—86-4202) Effects of self-consistent bag motion on the nucleon electric form factor.** Bolsterli, M.; Parmentola, J.A. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 5p. (CONF-870413—13). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000433.

From 11. international conference on particles and nuclei; Kyoto, Japan (20 Apr 1987).

It is shown that the inclusion of core motion has a large effect on the nucleon electric form factors and that the data are consistent with a bag radius of roughly 0.6 fermi. 1 ref., 2 figs.

50669 **(LA-UR—87-2892) Physics of few-body λ hypernuclei.** Gibson, B.F. (Los Alamos National Lab., NM (USA); Flinders Univ. of South Australia, Bedford Park. School of Physical Sciences). 1987. Contract W-7405-ENG-36. 20p. (CONF-8706212—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014746.

From International symposium on strangeness in hadronic matter; Bad Honnef, F.R. Germany (1 Jun 1987).

The energies of the particle-stable states in few-body Λ hypernuclei are summarized. Other topics reviewed include: the role of the hypertriton in determining the spin dependence of the ΛN force, the role of the hypertriton in three-body force investigations, the effect of medium modifications upon ΛN-ΣN coupling in the Λ-4 isodoublet and the spin dependence of the ΛN force, the importance of exact equation formalisms in interpreting precision data, and the need for a renewed effort to identify and measure the masses of ΛΛ hyperfragments. 40 refs., 4 figs., 3 tabs.

50670 **(LA-UR—87-2909) Pion double charge exchange and nuclear structure.** Ginocchio, J.N. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 14p. (CONF-8708102—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000516.

From Pion nucleus physics: future directions and new facilities at LAMPF workshop; Los Alamos, NM, USA (17 Aug 1987).

Pion double charge exchange to both the double-analog state and the ground state is studied for medium weight nuclei. The relative cross section of these two transitions and the importance of nuclear structure as a function of pion kinetic energy is examined. 16 figs., 5 tabs.

50671 **(LA-UR—87-3094) Production and propagation of mesons in complex nuclei.** Gibbs, W.R.; Kaufmann, W.B. (Los Alamos National Lab., NM (USA); Arizona State Univ., Tempe (USA). Dept. of Physics). 1987. Contract W-7405-ENG-36. 17p. (CONF-8708140—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000519.

From International workshop on Pi, Eta, Rho and omega mesons; Los Alamos, NM, USA (14 Aug 1987).

The propagation of unstable mesons in nuclei is considered with regard to the use of the nucleus as a micro-laboratory. Specific problems considered are those of the nu and the S*/δ systems. 17 refs., 12 figs.

50672 **(LA-UR—87-3126) Eta mesons in nuclei.** Liu, L.C. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 13p. (CONF-8708140—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000535.

From International workshop on Pi, Eta, Rho and omega mesons; Los Alamos, NM, USA (14 Aug 1987).

The possibility of producing eta-mesic nuclei by the use of pions is discussed. If these nuclei are observed experimentally, then the binding energies of the eta in this new nuclear matter can be used to extract accurately the eta-N-N* coupling constant in a nucleus. The framework for these calculations is the coupled channel isobar model. (DWL)

50673 **(NIKHEF-K—83/84) [National Institute of Nuclear Physics and High Energy Physics. Annual report July 1983-June 1984.** (Nationaal Inst. voor Kernfysica en Hoge-Energiefysica (NIKHEF), Amsterdam (Netherlands). Sectie K). Oct 1984. 101p. NTIS (US Sales Only), PC A06/MF A01. File Number DE87703640.

In this annual report of NIKHEF-K the current research on electron scattering and physics with pions, muons and baryons is described. It contains brief accounts of experimental and theoretical studies and their (preliminary) results. (Auth.). Contains bibliography of 119 refs. of publications prepared by NIKHEF-K and/or NIKHEF-K employees or in which they participated; 62 refs.; 43 figs.; 11 tabs.

50674 **(TRI-PP—87-45) Computer simulations of fragmentation.** Beauvais, G.E.; Boal, D.H.; Glosli, J. (Simon Fraser Univ., Burnaby, British Columbia (Canada). Dept. of Physics). Apr 1987. 11p. (CONF-870410—38). NTIS (US Sales Only), PC A02. File Number DE87900985.

From 193. national meeting of the American Chemical Society; Denver, CO, USA (5 Apr 1987).

A semiclassical model for describing nuclear reactions at intermediate energy is presented. The model is applied to the study of fragmentation in proton and heavy ion induced reactions. Computer simulations based on the model allow one to follow the evolution of the reactions in both coordinate and phase space. The reaction trajectories are found to be influenced by the existence of a mechanical instability region at a density of less than half normal nuclear matter density. 18 refs., 10 figs.

50675 **Heavy-ion fusion: Channel-coupling effects, the barrier penetration model, and the threshold anomaly for heavy-ion potentials.** Satchler, G.R.; Nagarajan, M.A.; Lilley, J.S.; Thompson, I.J. (Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6373). *Annals of Physics (New York);* **178**: No. 1, 110-143(15 Aug 1987). Contract AC05-84OR21400.

We study the formal structure of the influence of channel coupling on near- and sub-barrier fusion. The reduction to a one-channel description is studied, with emphasis on the channel-coupling effects being manifest primarily as an energy dependence (the "threshold anomaly") of the real nuclear potential. The relation to the barrier penetration model is examined critically. The results of large-scale coupled-channel calculations are used as "data" to illustrate the discussion. Particular emphasis is placed on the importance of reproducing correctly the partial-wave (or "spin") distributions. The simple barrier penetration model is found to be adequate to exhibit the strong enhancements due to channel couplings when the threshold anomaly is taken into account, although there may be important corrections due to the long-ranged peripheral absorption, especially from Coulomb excitation. copyright 1987 Academic Press, Inc.

50676 **Pion absorption in nuclei.** Ashery, D.; Schiffer, J.P. (Raymond and Berverly Sackler Faculty of Exact Sciences, Department of Physics, Tel-Aviv University, Ramat Aviv, Israel 69978). *Annual Review of Nuclear Science;* **36**: No. 1, 207-252(1986).

The possible mechanisms that explain pion capture data on various nuclei are reviewed. Emphasis is placed on targets of deuterium and He. (AIP)

50677 **Sub-barrier fusion reactions.** Steadman, S.G.; Rhoades-Brown, M.J. (Laboratory for Nuclear Science and Physics Department, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Annual Review of Nuclear Science;* **36**: No. 1, 649-681(1986).

Experimental and theoretical results on heavy ion fusion reactions through the Coulomb barrier are reviewed. The effects of transfer reactions are considered and multidimensional calculations are performed. (AIP)

50678 **Comments on the existence of strange dibaryons.** Hungerford, E.V. (University of Houston, Houston, Texas 77004). *AIP (American Institute of Physics) Conference Proceedings;* **133**: No. 1, 122-138(15 Sep 1985). (CONF-8503120—).

From Hadronic probes and nuclear interactions conference; Tempe, AZ, USA (11 Mar 1985).

The present status and future prospects for strange dibaryon observation is reviewed.

50679 **Quark structure of nuclei.** Goldman, T. (Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *AIP (American Institute of Physics) Conference Proceedings;* **133**: No. 1, 203-210(15 Sep 1985). (CONF-8503120—).

From Hadronic probes and nuclear interactions conference; Tempe, AZ, USA (11 Mar 1985).

The motivations for a direct description of nuclei in terms of quarks and gluons are discussed. A specific model implementing such a description is outlined. The importance of spin interactions for such descriptions is emphasized. Positive results, including a non-zero binding energy for a twelve quark system, are reported. Future plans and problems for refining the calculations are indicated.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 49470, 49473, 50506, 50523, 50720

50680 **(CONF-871101—7) A diffusion theory model for optimization calculations of cold neutron sources.** Azmy, Y.Y. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011159.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

This summary describes a simple two-group diffusion model of an infinite slab, liquid deuterium (LD_2) cold source. The simplicity of the model permits us to obtain an analytical solution from which we can deduce the reason for the optimum thickness based solely on diffusion type phenomena. Also, a second more sophisticated model is described, and the results compared to a deterministic transport calculation. The good (particularly qualitative) agreement between the results suggests that diffusion theory methods can be used in parametric and optimization studies in order to avoid the generally more expensive transport calculations. 5 refs., 1 fig.

50681 **(IAEA-TECDOC—410, pp 56-64) Neutron energy standards for white neutron sources.** Coceva, C. (Centro di Calcolo del ENEA, Bologna, Italy. Div. Fisica). Mar 1987. NTIS (US Sales Only), PC A19/MF A01. File Number DE87703411. (CONF-8606126—).

From International Atomic Energy Agency neutron source meeting; Leningrad, USSR (9 Jun 1986).

Some new experimental results and calculations bearing on calibration energies for neutron spectrometers are examined, and their influence on values and errors of the 1982 INDC/NEANDC Standard List is discussed. On this basis, a revised list is presented, to be considered as a draft proposed for the next updated issue of the INDC/NEANDC nuclear standards file. Critical aspects of the absolute determination of resonance energies by neutron time-of-flight are discussed and some recommendations are given for the correct use of the data and for future work in this field. 25 refs, 9 figs, 2 tabs.

50682 (INIS-BR—688, pp 235) **Accurate measurements of the thickness of thick targets about substrates by Rutherford back-scattering.** Acquadro, J.C.; Liguori Neto, R.; Chagas, E.F.; Gomes, P.R.S.; Carlin Filho, N.; Coimbra, M.M. (Sao Paulo Univ., Brazil. Inst. de Fisica; Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Universidade Federal Fluminense, Niteroi, Brazil). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50683 (INIS-BR—688, pp 241) **Measurements of target thickness by X-ray absorption.** Cataldi, M.I.C.; Martins, M.N. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50684 (INIS-BR—837, pp 85) **Kinetic description of nuclear photoabsorption process.** Ferreira Filho, L.G.; Nemes, M.C. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A07/MF A01. File Number DE87703733. (CONF-8608195—Pt.1).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50685 (INIS-BR—838, pp 59) **Determination by an adiabatic model of a nuclei perturbation factor in stopping in gases. Application to /sup 40/Ar (p,γ)/sup 41/K case.** Lepine-Szily, A.; Silveira, E.F. da. (Sao Paulo Univ., Brazil. Inst. de Fisica; Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50686 (INIS-BR—838, pp 71) **Determination of secondary electron production rate in thin films induced by energetic light ions.** Jeronymo, J.M.F.; Silveira, E.F. da. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50687 (INIS-BR—838, pp 85) **DE/DX of silver in gadolinium.** Medina, N.H.; Ribas, R.V. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50688 (INIS-BR—838, pp 87) **Measurements of stopping power for several elements using /sup 16/O and /sup 14/N ions.** Vilela, M.M.; Ribas, R.V.; Rotberg, V.H.; Villari, A.C.C.; Added, N. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50689 (INIS-BR—838, pp 89) **Measurement of alpha particle stopping power in aluminium by kinematic compensation method.** Baptista, G.B.; Patnaik, B.K. (Pontificia Univ. Catolica do Rio de Janeiro, Brazil. Dept. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50690 (INIS-BR—838, pp 92) **Reaches of implanted ions in amorphous C and SiO/sub 2/ targets.** Grande, P.L.; Fichtner, P.F.P.; Behar, M.; Livi, R.P.; Zawislak, F.C.; Biersak, J.P.; Fink, D.; Mertens, P. (Rio Grande do Sul Univ., Porto Alegre, Brazil. Inst. de Fisica; Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H., Germany, F.R.). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

50691 (INIS-mf—10998, pp 7) **Applications of neutron scattering techniques to molecular biology.** Cornell, B.A.; Knott, R. (Commonwealth Scientific and Industrial Research Organization, North Ryde, Australia. Div. of Food Research; Australian Atomic Energy Commission Research Establishment, Lucas Heights). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

50692 (INIS-mf—10998, pp 20) **Polarization analysis using a time of flight technique.** Osborn, J.C.; Cussen, L.D.; Hicks, T.J. (Monash Univ., Clayton, Australia. Dept. of Physics). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

50693 (INIS-mf—10998, pp 28) **Doing more with polarised neutrons.** Hicks, T.J. (Monash Univ., Clayton, Australia. Dept. of Physics). 1986. NTIS (US Sales Only), PC A03/MF A01. File Number DE88700209. (CONF-8611155—Absts.).

From 3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering; Lucas Heights, Australia (6 Nov 1986).

50694 **(JAERI-M—86-193) Neutron total cross section measurements on oxygen, aluminum and carbon below 930 keV.** Ohkubo, Makio. (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703614.

Neutron transmission measurements were made on aluminum, aluminum oxide and carbon using a TOF spectrometer of the Japan Atomic Energy Research Institute (JAERI) linac. Total cross sections of oxygen, aluminum and carbon were deduced below 930 keV.

6550 Medical Physics

REFER ALSO TO CITATION(S) 49450

50695 **(CTA-IEAV-NT—02/87) Study about chemical and radiological toxicity of rare earths.** Goncalez, O.L. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Estudos Avancados). Feb 1987. 24p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703402.

The maximum permissible concentration in workplace air for an admixture of rare earths is calculated to be 1.47 mg/m/sup 3/ of air. This value takes into account the biological mean-life of those chemical elements in human body and acute toxicological data. A simplified mathematical models is done that describes the body content of this product as a time function, for cronic intoxication by air particulate inhalation. Under the radiological point of view the limit calculated for the air concentration is about 100 mg/m/sup 3/, showing that the chemical toxity of these products is predominant.

50696 (IAEA-TECDOC—409, pp 263-267) **Prompt capture gamma-ray reference fields at Imperial College.** Mason, J.A. (Imperial Coll. Reactor Centre, Silwood Park, Ascot, UK). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

Reactor representative high energy gamma-ray reference fields can play an important role in the development of metrology techniques for reactor use. This paper describes the implementation and use of a high energy prompt capture gamma-ray field in the vertical thermal column of the CONSORT II reactor at Imperial College. The facility, which is based on the concept developed at SCK/CEN Mol, Belgium, employs thermal neutrons to generate an internal prompt capture gamma-ray field. A cylindrical absorber, which is black to thermal neutrons, is used as a neutron to gamma-ray converter. A neutron sensitive borated ionization chamber is used as a run to run monitor and the driving thermal neutron flux has been calibrated using an NBS type double fission chamber. Maximum gamma-ray dose rates in excess of 1000 R hr/sup -1/ have been measured using calibrated ionization chambers. 4 refs, 4 figs, 1 tab.

50697 (INIS-BR—794) **Proceedings of the Symposium of Medical Physics Esther Nunes Pereira.** (Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro). 1986. 8p. (In Portuguese). (CONF-860791—Absts.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537.

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

Abstracts of inspection in industries which use radioisotopes, dosimetry and monitoring in radiotherapy, fabrication of dosemeters, radiation exposure control for imaging and isodose calculations of beta and Bremsstrahlung radiation were presented. (M.C.K.).

50698 (INIS-BR—794, pp 2) **Dosimetry and monitoring of X-ray narrow beams produced by particle linear accelerator for using in radiosurgery.** Campos, J.C.F.; Vizeu, D.M. (Universidade Estadual de Campinas, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

50699 (INIS-BR—794, pp 4) **Optimized charts for portal films in therapy of megavoltage.** Faermann, S.; Leser, J. 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

50700 (INIS-BR—794, pp 5) **Determination of reference levels in industrial gammagraphy.** Leocadio, J.C.; Silva, F.C.A. da; Cunha, P.G. da; Farias, C. (Instituto de Radioprotecao e Dosimetria, Rio de Janeiro, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

50701 (INIS-BR—794, pp 6) **Experimental determination of isodose curves in the air for beta radiation and Bremsstrahlung.** Caldas, L.V.E. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1986. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703537. (CONF-860791—Absts.).

From 38. annual meeting of the Brazilian Society for the Advancement of Science; Curitiba, Brazil (9 Jul 1986).

50702 (INIS-BR—800) **Experimental determination of isodose curves in the air for beta radiation and Bremsstrahlung.** Caldas, L.V.E. (Associacao Brasileira de Fisicos em Medicina, Rio de Janeiro). 1986. 14p. (In Portuguese). (CONF-8607341—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703543.

From Symposium on Medical Physics Esther Nunes Pereira; Curitiba, Brazil (9 Jul 1986).

The values of absorbed radiation doses in the air were determined aiming to obtain the isodose curves, for beta radiation and for Bremsstrahlung radiation of a /sup 85/Kr source, in several distances. Mamography films and a scintillator detector were used. The method was efficient for determining the radiation field and can be used for industrial and medical sources. (E.G.).

50703 (INIS-BR—834) **Detection of beta radiation emitted from painted tiles.** Caldas, L.V.E. (Sociedade Brasileira de Fisica, Sao Paulo). 1987. 7p. (In Portuguese). (CONF-8705181—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703730.

From 10. national meeting on condensed matter physics; Caxambu, Brazil (5 May 1987).

At the Krafwerk Union (KWU), Erlangen, Germany, it was confirmed that some types of painted tiles of Italian origin were radioactive. In this Work, performed at Institut fur Strahlenschutz, GSF, Germany, ultrathin 60μm) thermoluminescent samples of CaSO/sub 4/:Tm were used for the determination of absorbed dose rates in air (at the tile surface and at distance of 5cm from it) and of transmission factors for different tissue equivalent material thicknesses. For comparison the absorved dose rates in air from cement walls without tile revestment and with simple tile revestment (tiles without painted ornaments) were also determined. In these cases the results were the same as those obtained normally from building materials.

50704 (KURRI-TR—283, pp 16-23) **Evaluation of effective dose equivalent for personal dosimetry.** Miyabe, Kenjiro; Ishiguro, Hideharu. (Power Reactor and Nuclear Fuel Development Corp., Tokai, Ibaraki, Japan. Tokai Works). Nov 1986. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780169. (CONF-8508243—).

From Short-term conference on evaluation of effective dose equivalent for personal dosimetry; Kumatori, Osaka, Japan (2 Aug 1985).

The concept of effective dose equivalent was recommended as a primary limit in the ICRP publication 26. And dose equivalent index and ALI were introduced as the secondary limits for external and internal dose limitation system respectively. The evaluation method of effective dose equivalent and its application to a routinal dosimetry were studied as the followings, 1). For the external dose evaluation, the measuring method of 1 cm deep dose equivalent by a TL-dosemeter using Li/sub 2/B/sub 4/O/sub 7/(Cu) element is shown. Also the relationship between 1 cm deep dose equivalent and effective dose equivalent is disscused. 2). For the internal dose evaluation, the monitoring methods and the dose evaluation method are shown for the case of /sup 239/Pu or /sup 137/Cs intake.

50705 (KURRI-TR—283, pp 24-30) **On the evaluation methods of effective dose equivalent for γ-rays in JAERI.** Minami, Kentaro. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Nov 1986. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780169. (CONF-8508243—).

From Short-term conference on evaluation of effective dose equivalent for personal dosimetry; Kumatori, Osaka, Japan (2 Aug 1985).

For the radiation monitoring of workers, a film badge, pocket dosimeters and personal alarm dosimeters have been employed in JAERI for the measurement of dose by photon. Personal exposure dose which is measured with film badge has been evaluated as a maximum in human body for various photon energy. In this paper, the phantom response of film badge and other personal dosimeters and a characteristic of phantom for calibration are described.

50706 (KURRI-TR—283, pp 31-38) **Relation among gamma-ray energy spectra, exposure rates and effective dose equivalents rates in the working places of the KUR reactor room.** Urabe, Itsumasa. (Kyoto Univ., Kumatori, Osaka, Japan. Research Reactor Inst.). Nov 1986. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780169. (CONF-8508243—).

From Short-term conference on evaluation of effective dose equivalent for personal dosimetry; Kumatori, Osaka, Japan (2 Aug 1985).

Exposure rates and Effective dose equivalents are estimated on the basis of gamma-ray energy spectra in some places of the KUR reactor room. A relation among those radiation protection quantities are investigated to know the most appropriate way for estimation of radiation risks to radiation workers.

50707 (KURRI-TR—283, pp 50-56) **Experimental approach to depth dose by thermal neutron incident upon a spherical phantom for personnel dosimetry.** Ogawa, Yoshihiro; Kimura, Yuichiro; Honda, Yoshihide. (Kinki Univ., Higashi-Osaka, Osaka, Japan. Faculty of Science and Technology). Nov 1986. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780169. (CONF-8508243—).

From Short-term conference on evaluation of effective dose equivalent for personal dosimetry; Kumatori, Osaka, Japan (2 Aug 1985).

Depth doses by thermal neutron upon a polyethylene spherical phantom having a diameter of 30 cm were measured. In the (n,γ) reaction with hydrogen neutron-induced gamma-ray was measured with thermoluminescent dosimeter. In the (n,p) reaction with nitrogen-14 emitted proton was calculated by using depth thermal neutron flux measured with gold foil activation. The details of this study are described.

50708 (KURRI-TR—283, pp 42-49) **Experimental evaluation of effective dose equivalent for neutrons.** Katoh, Kazuaki; Kang, Yung-Ho. (National Lab. for High Energy Physics, Oho, Ibaraki, Japan). Nov 1986. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780169. (CONF-8508243—).

From Short-term conference on evaluation of effective dose equivalent for personal dosimetry; Kumatori, Osaka, Japan (2 Aug 1985).

The study is aimed at providing a technique for evaluating the effective dose equivalent based on measurements of either the ionization density (observed by TLD or small-cavity ionization chamber) or the recoil nucleus density (observed by SSNTD) in a phantom, or weighted sum of them. For a phantom composed of soft tissues, depth distribution of absorbed dose is calculated on the assumption that the incident neutrons are perpendicular to the phantom axis. The absorbed dose is divided into two components: Dγ and Dp representing the contributions in the form of capture gamma rays and recoil protons, respectively. The depth distribution calculated above are then compared with a curve which represents the energy dependence of effective dose equivalent per unit fluence to determine the appropriateness of the calculations. Next, the recoil proton density in a pohantom is actually measured by SSNTD to provide data on the dependence of the depth distribution on the angle of the incident neutrons. This makes it possible to determine the feasibility concerning the measurement technique. It is inferred from these calculations and measurements that the effective dose equivalent can be evaluated appropriately by using SSNTD to perform selective observation of recoil proton fluence at a depth of 1 centimeter in a phantom. (Nogami, K.).

50709 **(KURRI-TR—283) Proceedings of the short-term conference on evaluation of effective dose equivalent for personal dosimetry.** Honda, Yoshihide; Katsurayama, Kousuke; Tsujimoto, Tadashi (eds.). (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Nov 1986. vp. (In Japanese). (CONF-8508243—). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780169.

From Short-term conference on evaluation of effective dose equivalent for personal dosimetry; Kumatori, Osaka, Japan (2 Aug 1985).

Separate abstracts were prepared for the individual papers in these proceedings.

6560 Condensed Matter Physics

REFER ALSO TO CITATION(S) 49474, 49965, 50172, 50380

50710 **(CBPF-NF—003/86) Phase separation and dynamical scaling in borate glasses.** Craievich, A.F.; Sanchez, J.M.; Williams, E. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 38p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703351.

Quasi-binary B/sub 2/O/sub 3/ - PbO - (Al/sub 2/O/sub 3/) glasses of two different compositions and at several temperature inside the miscibility gap were investigated using small angle X-ray scattering. Measurements were carried out using an X-ray beam from a synchrotron source in spin-hole collimation and the samples were isothermally annealed in situ.

50711 **(CBPF-NF—008/86) Electrical resistivity of Y(Fe/sub 1-x/ Al/sub x/)/sub 2/ in the spin glass concentration range.** Cunha, S.F. da; Souza, G.P. de; Takeushi, A.Y. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703352.

The temperature dependence of the electrical resistivity of the Y(Fe/sub 1-x/Al/sub x/)/sub 2/ system ($0.125 \leqq x \leqq 0.25$) was measured. This system exhibits a minimum at low temperatures for the concentration range where the phase diagram presents a spin glass-ferromagnetic transition. A negative temperature coefficient is observed at high temperatures for $x > 0.18$ and was attributed to the high value of the electrical resistivity in this concentration range.

50712 **(CBPF-NF—029/86) Influence of bond dilution on the free surface and interface Potts ferromagnetism.** Sarmento, E.F.; Albuquerque, E.L. de; Tsallis, C. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703360.

Within a simple real space renormalization group framework, the phase diagram of a q-state Potts ferromagnetic system constituted by two semi-infinite bulks separated by a planar interface is discussed. Quenched bond dilution has been assumed in the bulks as well as in the interface. The system exhibits percolation-like phenomena which generalize the standard $d=2$ and $d=3$ ones. Also, competition between bulk dilution (which enhances surface magnetism) and interface dilution (which depresses surface magnetism) is observed.

50713 **(CBPF-NF—036/86) Moessbauer study of shock induced effects in the FE-NI 50/50 ordered alloy in meteorites.** Scorzelli, R.B.; Azevedo, I.S.; Danon, J. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703364.

Using the flying plate technique we have investigated by Moessbauer Spectroscopy, the shock induced effects in the ordered iron-nickel alloy of meteorites. The degree of long-range order in the ordered alloy is reduced by shock event.

50714 **(CBPF-NF—049/86) Spin echo amplitude in pulsed NMR: effects of electric quadrupole interactions.** Sobral, R.R.; Silva, X.A. da; Guimaraes, A.P. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703373.

In ferromagnetic systems where the NMR spectra present unresolved electric quadrupole interactions the spin echo amplitude shows an oscillatory behaviour as a function of the time separation tau between excitation pulses. These oscillations are in general attenuated. Spin echo amplitudes are numerically computed, using a simple algorithm. The calculation is made for several values of the nuclear spin I and for different excitation conditions. The curves

are compared with available analytical calculations. The amplitudes of the multiple spin echoes (for I > 1) are also obtained. The calculation is extended to the case of non-axially symmetric electric field gradients (EFG's) and to inhomogeneous EFG's; the attenuation in the corresponding amplitudes confirms that these conditions explain curves observed experimentally. (Authors).

50715 **(CBPF-NF—052/86) NMR study of the change in the direction of magetization of HoCo/sub 2/.** Guimaraes, A.P.; Alves, N.; Alves, K.M.B.; Gratz, E. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703375.

The intermetallic compound HoCo/sub 2/ is magnetically ordered and changes its direction of magnetization around 15 k, as the temperature is increased, from [110] to [100]. A /sup 59/Cc pulsed NMR study of HoCo/sub 2/ is reported in the temperature range 4 k- 65 k. The NMR spectra show two peaks at low temperature and one peak at high temperatures, as expected from a model whereby the magnetic equivalence of the cobalt sites is determined by the direction of magnetization. This change in the spectra can be simulated from lattice sums of the magnetic dipolar fields acting on the cobalt sites. The present results are consistent with a change of direction of magnetization from [110] to [100] through intermediate directions contained in the plane z=0.

50716 **(CNEA-NT—16/85) First national meeting of magnetic resonance and hyperfine interactions.** (Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche). Jul 1985. 208p. (In Spanish). (CONF-8307170—). NTIS (US Sales Only), PC A10/MF A01. File Number DE87703676.

From 1. national meeting of magnetic resonance and hyperfine interactions; San Carlos de Bariloche, Argentina (18 Jul 1983).

Works performed at CNEA's: Magnetic Resonance Division; Moessbauer Spectroscopy; Solid State Physics Division; Nuclear magnetic Resonance Laboratory and Theoretical Physics Group; Mossbauer Spectroscopy Group; Nuclear Quadrupole Resonance; Physics and Materials Group; Perturbed Angular Correlation and Moessbauer Spectroscopy and Physics Department. (M.E.L.).

50717 **(CNIC—00020) Thermal neutron inelastic scattering and it's application to the material science.** Li Zhuqi. (China Nuclear Information Centre, Beijing, BJ). 1986. 21p. (In Chinese). (IAE—0014). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703388.

A brief description of the elementary scattering theory of the interaction between the thermal neutrons and the condensed matter is given and the characteristics related to the experimental method of the thermal neutrons inelastic scattering is described. Expressions of the phonons dispersion, density of the phonon state and the self-diffusion coefficient at the some conditions are also introduced. Some examples of describing diagram of the phonon dispersion, density of the phonons state and selfdiffusion coefficient measured by different authors are given.

50718 **(CRN-CPR—86-05) Contribution to the study of X-ray emission induced by accelerated bromine and krypton ions and possibilities of analytical applications.** Tenorio Castilleros, M.D. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1986. 128p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE87752808.

In view of analytical applications the X-ray emission induced by 3 to 85 MeV Br and Kr ions has been studied. Thick target yields have been measured and ionization cross section for K and L shells have been calculated. The X-ray emission rates and energy shifts have also been determined. The results are discussed in the frame of the actually existing models for inner shell ionization in atomic collisions. As a practical application azteque ceramics have been analyzed. The possibilities and the difficulties of the technic are emphasized.

50719 **(DOE/ER/60415—T1) Photoemission of n-ethylene glycols in the vacuum ultraviolet.** Jiang, Lili. (Tennessee Univ., Knoxville (USA)). Dec 1986. Contract FG05-86ER60415. 76p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000378.

Measurements of the absolute photoemission of liquids in the vacuum ultraviolet (uv) have been taken. Studies have focused on photoelectric yields of diethylene glycol, triethylene glycol, and tetraethylene glycol undoped and doped with lithium hydroxide solution (LiOH). The electron mean free paths calculated from experimental photoyields are submitted. Photon fluxes are determined by filling the ion chambers with argon gas. The absolute photoyield curves generally show monotonic behavior with the values in the neighborhood of 15% to 20%. These absolute photoyields are higher than expected. The data of our experiments indicate that the effects of doping with alkali salts on these n-ethylene glycols are small. The relation between the photoyields and the electron mean free paths is broken down in the photon energy region 16 eV to 30 eV when the threshold energy is 8 eV. It is suggested, therefore, that the photoelectric threshold energy be less than 8 eV and larger than 7 eV. Our electron mean free paths were compared with the empirical equation predicted from Seah and Dench for organics. The electron mean free paths calculated from our experimental data exceeded those predicted by Seah and Dench. Therefore, the empirical equation is not suitable for these n-ethylene glycols in the photon energy region 16 eV to 30 eV at low pressure. 29 figs.

50720 (IAEA-TECDOC—409, pp 155-161) **Neutron physics.** Balasko, M.; Cser, L.; Rosta, L.; Svab, E. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—; CONF-850932—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

The spectrometers for neutron radiography, neutron diffraction and small angle neutron scattering investigations were built in the Central Research Institute for Physics using thermal neutrons obtained from the WWR-S reactor. The main characteristics of the spectrometers and an activity in this field are described. 5 figs.

50721 (IAEA-TECDOC—409, pp 281-297) **New neutron scattering instruments at Risoe National Laboratory: A multipurpose spectrometer and the SANS facility.** Lebech, B.; Freltoft, T.; Juul Jensen, D.; Broholm, C.; Clausen, K.; Jensen, L.G.; Kjems, J.K.; Mortensen, K. (Risoe National Lab., Roskilde, Denmark). Mar 1987. NTIS (US Sales Only), PC A18/MF A01. File Number DE88700114. (CONF-8512139—).

From Technical committee meeting on research reactor activities in support of national nuclear programmes; Budapest, Hungary (10 Dec 1985).

Two neutron scattering instruments recently installed at the DR3 reactor at Risoe National Laboratory are described and examples of experimental results are given. One instrument is a multipurpose instrument TAS3 which can be operated in three different modes: 1) TAS-MODE: In this mode the detector system consists of a complete analyser-detector system, and the instrument is a conventional neutron triple-axis-spectrometer used for inelastic neutron scattering. 2) DAS-MODE: In this mode the detector system consists of a detector system, which can be rotated around the vertical sample axis and in addition by means of an automated mechanical tilt can be tilted from 5 deg. below to 25 deg. above the horizontal plane. The spectrometer is used for elastic neutron scattering. 3) DPS-MODE: In this mode the detector system is a linear position sensitive detector which is mounted vertically in the mechanical tilt device used in the DAS-mode. The DPS-mode supplements the DAS-mode and has proven to be useful in single crystal structural studies when searching for satellite Bragg peaks in odd directions of reciprocal space. 4) TEX-MODE: This mode is used for measuring texture of polycrystalline materials, both statistical and dynamical. An Eulereian craddle is mounted on the sample table, and the detector system consists of a linear position sensitive detector mounted as in the DPS-mode. The other facility to be described is the six meter Small Angle Neutron Scattering facility SANS. It is situated at a cold source beam outside the DR3 reactor confinement at the end of a 20 m long neutron guide. A mechanical velocity selector with variable tilt provides the monochromatization with $\Delta\gamma/\gamma$ in the range 0.05 to 0.20. As a novel feature the sample is placed in high vacuum, (< 10/sup -6/ mbar), without windows be-

tween the entrance slit and the 40cmx40cm area-sensitive detector. 25 refs, 7 figs.

50722 **(INIS-BR—689) Ions displacement through glasses.** Sevegnani, F.X. (Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1980. 168p. (In Portuguese). NTIS (US Sales Only), PC A08/MF A01. File Number DE87703449.

A method to introduce sodium, potassium, lithium, calcium, iron and other ions in vacuum or gas light bulb by mean of a strong stationay electric field. The experiments showed that the mass deposited inside the bulbs obey Faraday's law of electrolysis, although the process of mass transfer is not that of a conventional electrolysis. A method which allows to show that hydrogen ions do not penetrate the glass structure is also described. Using radioactive tracers, it is shown that heavy ions, such PO/sub 4//sup —/do not penetrate the glass structure. The vitreous state and the glass properties were studied for interpreting experimental results.

50723 (INIS-BR—696, pp 46) **Application of oxygen-17 and carbon-13 in conformational analysis.** Eliel, E.L. (North Carolina Univ., Chapel Hill, USA. Dept. of Chemistry). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

50724 (INIS-BR—696, pp 53) **High resolution NMR of organic materials in the solid state: structure and dynamics.** Yannoni, C.S. (IBM Almaden Research Center, San Jose, CA, USA). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

50725 (INIS-BR—696, pp 65) **/sup 1/H-NMR applications to the study of unsaturated polyester resins (USPR) and other industrial products.** Bisso, M.C.; Botto, H.A.; Calatayud, M.T. (Instituto Nacional de Tecnologia Industrial, San Martin, Buenos Aires, Argentina. Dept. de Quimica). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

50726 (INIS-BR—696, pp 65) **Analysis of non-linear effects on slice selection in MR imaging.** Bonagamba, T.J.; Magon, C.J.; Beckmann, N.; Tannus, A.; Panepucci, H.C. (Sao Paulo Univ., Sao Carlos, SP, Brazil. Inst. de Fisica e Quimica). 1986. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703456. (CONF-8607338—).

From Workshop on recent developments in organic NMR; Campinas, SP, Brazil (7 Jul 1986).

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The unique spectral properties of /sup 13/C-NMR for studying nucleic acids and some of the important features of /sup 13/C-NMR in oligonucleotide studies are demostrated. The main difficulty in studying oligonucleotides by /sup 13/C-NMR and recent improvements in NMR instrumentation and advances in oligonucleotide synthesis are presented. The high resolution /sup 13/C-NMR spectra, T/sub 1/ relaxation times and NOEs were measured for duplex of the self-complementary oligo-DNAs: d(CG)/sup 3/ and d(GGTATACC) are studied. The target of this study is to developed a systematic /sup 13/C-NMR spectral assignment and to investigate the structure and dynamics of these two sequences by this techniques. (M.J.C.).

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50785 (PSD—87, pp F2) **Evidence of vacancies and dislocations associated with precipitates in Al-Zn and Al-Zn-Mg by position annihilation, X-ray small-angle scattering and high resolution transmission electron microscopy.** Dlubek, G.; Wendrock, G.; Ramlau, R.; Loeffler, H.; Krause, R.; Bruemmer, O. (Paedagogische Hochschule N.K. Krupskaja, Halle, German Democratic Republic. Sektion Mathematik/Physik; Martin-Luther-Universitaet Halle-Wittenberg, Halle, German Democratic Republic. Sektion Physik). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50786 (PSD—87, pp F3) **Internal electronic properties of positron traps from Fourier transformation of angular correlation.** Dlubek, G.; Gerber, W. (Paedagogische Hochschule N.K. Krupskaja, Halle, German Democratic Republic. Sektion Mathematik/Physik). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50787 (PSD—87, pp F4) **Theory of positron annihilation in alloys containing Guinier Preston zones.** Glaeser, U.H.; Dlubek, G. (Paedagogische Hochschule N.K. Krupskaja, Halle, German Democratic Republic. Sektion Mathematik/Physik). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50788 (PSD—87, pp F5) **Precipitation in AlSi1 studied by TEM and PA.** Haeussler, D.; Daut, H.H.; Jacobi, G.; Krause, R.; Dlubek, G.; Bruemmer, O. (VEB Mansfeld Kombinat Wilhelm Pieck, Freiberg, German Democratic Republic. Forschungsinstitut fuer NE-Metalle; Martin-Luther-Universitaet Halle-Wittenberg, Halle, German Democratic Republic. Sektion Physik). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50789 (PSD—87, pp G1) **Annealing study of He-irradiated Ni samples.** Lemahieu, I.; Segers, D.; Dorikens-Vanpraet, L.; Dorikens, M.; Deschepper, L.; Stals, L.; Severne, G. (Ghent Rijksuniversiteit, Belgium. Lab. voor Kernfysica; L.U.C., Universitaire Campus, Diepenbeck, Belgium. Dept. of Material Science; V.U.B. Bruessel, Belgium. Dept. of Physics). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50790 (PSD—87, pp G2) **Positron lifetime study of helium clustering in Ni and Ni-1 at% Ti.** Amarendra, G.; Viswanathan, B.; Gopinathan, K.P. (Indira Gandhi Centre for Atomic Research, Kalpakkam, India). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50791 (PSD—87, pp G3) **Slow positron study of krypton implanted in metals.** Britton, D.T.; Rice-Evans, P.C.; Evans, J.H. (Royal Holloway Coll., Egham, UK; UKAEA Atomic Energy Research Establishment, Harwell. Materials Development Div.). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50792 (PSD—87, pp G4) **Positron trapping by radiation defects in metals.** Ilyasov, A.Z. (AN Uzbekskoj SSR, Tashkent. Inst. Ehlektroniki). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50793 (PSD—87, pp G6) **Observation of precipitates in a supersaturated Fe-Cu alloy by muon spin rotation (μ/sup +/ SR) spectroscopy: a step to understand embrittlement of reactor pressure vessel steels.** Solt, G.; Waeber, W.B.; Schenck, A.; Gygax, F.N.; Barth, S.; Frisius, F. (Schweizerische Interessengemeinschaft zur Wahrnehmung Gemeinsamer Interessen an der Entwicklung Nuklearer Technologien, IGNT, Wuerenlingen; Eidgenoessische Technische Hochschule, Zurich, Switzerland; Forschungszentrum GKSS, Geesthacht, Germany, F.R.). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50794 (PSD—87, pp G7) **Application of the positron annihilation method for investigations of the diffusion of helium in metals.** Pajak, J.; Pietrzak, R.; Szatanik, R.; Rozenfeld, B. (Pedagogical Univ., Opole, Poland. Inst. of Physics; Wroclaw Univ., Poland). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50795 (PSD—87, pp H1) **Anisotropy effect of high momentum of ADAP in diamond-like semiconductors.** Arutyunov, N.Yu.; Baltenkov, A.S.; Segal, I.D. (AN Uzbekskoj SSR, Tashkent. Inst. Ehlektroniki; Ministerstvo Geologii Uzbekskoj SSR, Tashkent). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50796 (PSD—87, pp H2) **Pick-off annihilation in a-Si:H: substrate temperature effect.** Denskar, S.; Shaligram, A.; David, S.K. (Modern College, Pune, India. Dept. of Physics; Poona Univ., Pune, India). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50797 (PSD—87, pp I5) **Macrostructure of pyrolitic boron nitride.** Arefiev, K.P.; Lopatin, V.V.; Surov, Yu.P. (Tomskij Politekhnicheskij Inst., USSR. Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50798 (PSD—87, pp I6) **Positron annihilation in GaAs.** Pasajov, G.; Misheva, M.; Mishev, P.; Toumbev, G. (Sofia Univ., Bulgaria. Fizicheski Fakultet; Bylgarska Akademiya na Naukite, Sofia. Inst. za Yadrena Izsledvaniya i Yadrena Energetika). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50799 (PSD—87, pp I7) **Positron lifetime studies on electron irradiated III-V semiconductors.** Liszkay, L.; Balogh, A.G. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50800 (PSD—87, pp I9) **Positron annihilation measurements in as-grown and in 3 MeV electron irradiated InSb.** Sen Gupta, A.; Moser, P.; Corbel, C. (CEN-Grenoble DRF/SPh/MP, France; CEN-Saclay, Gif-sur-Yvette, France). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50801 (PSD—87, pp I11) **Study of vacancy defects in GaAs by positron annihilation.** Krause, R.; Dlubek, G.; Hautojaervi, P.; Maekinen, J.; Saarinen, K.; Nyberg, P. (Martin-Luther-Universitaet Halle-Wittenberg, Halle, German Democratic Republic. Sektion Physik; Paedagogische Hochschule N.K. Krupskaja, Halle, German Democratic Republic. Sektion Mathematik/Physik; Helsinki Univ. of Technology, Espoo, Finland. Lab. of Physics). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50802 (PSD—87, pp I12) **Study of point defects in GaAs.** Dlubek, G.; Dlubek, A.; Krause, R.; Bruemmer, O.; Friedland, K.; Rentsch, R. (Paedagogische Hochschule N.K. Krupskaja, Halle, German Democratic Republic. Sektion Mathematik/Physik; Akademie der Wissenschaften der DDR, Berlin. Zentralinstitut fuer Elektronenphysik). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50803 (PSD—87, pp I13) **Vacancy defects in as-grown and n/sup 0/-irradiated GaP and GaAs/sub 1-x/P/sub x/ studied by positrons.** Dlubek, G.; Bruemmer, O.; Polity, A. (Paedagogische Hochschule N.K. Krupskaja, Halle, German Democratic Republic. Sektion Mathematik/Physik). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50804 (PSD—87, pp G5) **Influence of alloying elements on defect structure in neutron-irradiated zirconium alloys.** Sob, M.; Pavlovsky, J.; Pahutova, M.; Kocik, J. (Ceskoslovenska Akademie Ved, Brno. Biofysikalni Ustav; Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50805 (PSD—87, pp I1) **Investigation of radiation defects in electron irradiated Hg/sub 1-x/Cd/sub x/Te crystals using positron annihilation.** Voitsekhovskii, A.V.; Kokhanenko, A.P.; Petrov, A.S.; Lilenko, Yu.V.; Pogrebnyak, A.D. (Tomskij Gosudarstvennyj Univ., USSR. Sibirskij Fiziko-Tekhnicheskij Inst.). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50806 (PSD—87, pp I2) **Radiation induced defects in A/sup III/B/sup V/ compounds investigated by the positron annihilation method.** Pogrebnjak, A.D.; Ruzimov, Sh.M.; Brudnii, V.N. (Tomskij Politekhnicheskij Inst., USSR. Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki; Tomskij Gosudarstvennyj Univ., USSR. Sibirskij Fiziko-Tekhnicheskij Inst.). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50807 (PSD—87, pp I3) **Decrease of the presence of defects in GaAs(Si,Sn) epitaxial films and improvement on electric-physical and spectrometric parameters of radiation Si detectors under positron irradiation.** Kuznetsov, P.V.; Arefiev, K.P.; Sokhoreva, V.V. (Academy of Sciences of Siberian Branch USSR, Tomsk. Inst. of Physics of Hardness and Materials; Tomskij Politekhnicheskij Inst., USSR. Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50808 (PSD—87, pp I4) **Positron studies of radiation-induced defects (R-I-D) in some semiconducting compounds.** Kuznetsov, V.D. (Tomskij Gosudarstvennyj Univ., USSR. Sibirskij Fiziko-Tekhnicheskij Inst.). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50809 (PSD—87, pp I8) **Annealing study in 3 MeV electron irradiated GaP by positron annihilation technique.** Sen Gupta, A.; Moser, P.; Corbel, C.; Hautojaervi, P.; Sen, P. (CEN-Grenoble, DRF/SPh/MP, France; CEN-Saclay, INSTN, Gif sur Yvette, France; Helsinki Univ. of Technology, Espoo, Finland. Lab. of Physics; Saha Inst. of Nuclear Physics, Calcutta, India). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50810 (PSD—87, pp I10) **Low temperature investigations of e/sup -/ irradiated GaAs.** Mascher, P.; Kerr, D.; Dannefaer, S. (Winnipeg Univ., Manitoba, Canada. Dept. of Physics). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50811 (PSD—87, pp I14) **Defect study of proton and neutron irradiated GaP.** Ascheron, C.; Dlubek, G.; Krause, R.; Erhard, H.; Klimm, D. (Karl-Marx-Universitaet, Leipzig, German Democratic Republic. Sektion Physik; Paedagogische Hochschule N.K. Krupskaja, Halle, German Democratic Republic. Sektion Mathematik/Physik; Karl-Marx-Universitaet, Leipzig, German Democratic Republic. Sektion Chemie). 1987. NTIS (US Sales Only), PC A09/MF A01. File Number DE87703128. (CONF-8703162—).

From European meeting on positron studies of defects; Wernigerode, German D.R. (23 Mar 1987).

50812 (PUC-TN—01/84) **Potts chain in a random field: an exact solution.** Riera, R.; Chaves, C.M.G.F.; Santos, R.R. dos. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703641.

An exact solution is presented for the one-dimensional q-state Potts model in a quenched random field. The ferromagnetic phase is unstable against any small random field perturbation. The correlation function and the Edwards-Anderson order parameter Q are discussed. For finite q only the phase with Q not = 0 is present.

50813 (PUC-TN—03/84) **Molecular Cluster-Indo calculations of substitutional defects in Alkali-Halides.** Matos, M.; Maffeo, B. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703642.

The one electron level structure of LiF, NaF, LiCl and NaCl crystals containing F and U centers and of NaCl crystal containing U/sub 3/ centers are calculated using the INDO method and the molecular cluster (MC) approximation, with special enphasis in parameterization; spin polarization is considered in the Unrestricted Hartree Fock formulation of the method. The F and U band transition energies are estimated through a limited configuration interaction (CI) calculation, being the electronic mechanism involved in the U/sub 3/ absorption band also examined. It is made a rough estimation of the spin density at the substitutional H atom nucleus in NaCl.

50814 (PUC-TN—06/84) **Transverse Ising spin-glass model.** Santos, R.R. dos; Santos, R.M.Z. dos. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703645.

The zero temperature behavior of the Transverse Ising spin-glass (+-J/sub 0/) model is discussed. The d-dimensional quantum model is shown to be equivalent to a classical (d + 1)- dimensional Ising spin-glass with correlated disorder. An exact Renormalization Group treatment of the one-dimensional quantum model indicates the existence of a spin-glass phase. The Migdal-Kadanoff approximation is used to obtain the phase diagram of the quantum spin-glass in two-dimensions.

50815 (PUC-TN—09/84) **Absorption of circularly polarized light by solids.** Jalbert, G.; Brandi, H.S. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). Mar 1984. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703647.

The multiphoton absorption rate of circularly polarized light, by direct gap crystals, was investigated following a non-perturbative scheme proposed by Jones and Reiss. It was possible to derive closed analytical solutions, for the N-photon transition rate, valid for all field strenghts of practical interest. The accuracy of the approximations introduced in deriving these results was determined comparing the numerical computations of the multiphoton transition rate ('exact') with the analytical solutions. Specific calculations are done for ZnS and GaAs in the presence of a Nd-laser. It is shown that this formalism leads to a total transition rate which has not the tunneling behavior previously discussed by several authors within similar contexts.

50816 (PUC-TN—10/84) **High and low spin thermal equilibrium in met-haemoglobin and met-myoglobin.** Wajnberg, E.; Kalinowski, H.J.; Bemski, G. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). Apr 1984. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703648.

Electron Spin Resonance (ESR) is used in the study of high and low spin states mixture for metmyoglobin (metmb) and methemoglobin (methb). Metmb and methb crystals are in the high spin form and only powdered samples show the spin states equilibrium. The temperature dependence of the ESR intensity shows that the high to low spin state ratio, K/sup -1/, is an exponential function of the inverse of temeperature. The K/sup -1/ slope depends on the sample cooling rate and on the temperature range of observation. The results are explained based on the temperature dependence of the crystal field intensity in hemoproteins and that it can take different values within a certain width near a critical value, Δ/sub c/.

50817 (PUC-TN—20/84) **Numerical simulation of λ PHI /sup 4//sub 4/.** Amaral, M.G. do; Carvalho, C.A.A. de; Shellard, R.C. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703650.

The behaviour of a lattice theory where spontaneous symmetry breaking occurs is studied. The effective potential and obtain the phase diagram of an Euclidean λ PHI /sup 4//sub 4/ theory using Monte Carlo methods on a hypercubic lattice with 4/sup 4/ sites and periodic boundary conditions was calculated and discussed. The vacuum expectation value PHI/sub C/, in the presence of external source j(x), keeping the parameter $\beta = 1/\lambda$ fixed was examined. PHI/sub c/ is the limit of PHI as J->0. For values of β greater than β/sup critical/, PHI/sub c/ = 0, while for values of β lesser than β/sub critical/, PHI/sub c/ = 0. λ PHI /sup 4/ field theory exhibits two phases,a disordered phase in which the vacuum expectation value of the field vanishes and an ordered phase which is characterized by spontaneous magnetization. The value of β critical is estimated through the specific heat and susceptibility.

50818 (SAND—87-0967C) **A dissipation principle and its consequences for structured shock waves in thermoelastic materials.** Dunn, J.E.; Fosdick, R. (Sandia National Labs., Albuquerque, NM (USA); Minnesota Univ., Minneapolis (USA). Dept. of Aerospace Engineering and Mechanics). 1987. Contract AC05-84OR21400. 5p. (CONF-870753—73). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013723.

From 5. topical conference of the American Physical Society on shockwaves in condensed matter; Monterey, CA, USA (20 Jul 1987).

The main purpose of this paper is to discuss how supersonic-subsonic conditions arise as a natural manifestation of the entropy inequality for any Rayleigh trajectory, whether or not the global a priori constitutive inequalities hold. Also sketched in this paper is a proof of a fundamental theorem for a steady structured shock wave of a Rayleigh trajectory. (LSP)

50819 (SAND—87-1832C) Interatomic Auger rates for the sodium fluoride crystal. Green, T.A.; Jennison, D.R. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 3p. (CONF-8705194—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013012.

From 3. international workshop on desorption induced by electronic transitions; Shelter Island, NY, USA (20 May 1987).

Interatomic Auger rates for the NaF crystal are calculated for initial 1s, 2s, and 2p holes in the Na^+ ion. The crystal is simulated by an $(NaF_6)^{5-}$ cluster embedded in a large number of point ions, and the one-electron orbitals are obtained from restricted Hartree-Fock calculations of the initial state. The calculated interatomic Auger widths for the transitions Na(1s)Na(2p)F(2p), Na(2s)Na(2p)F(2p), and Na(2p)F(2p)F(2p)′ are 0.00173, 0.641, and 0.153 eV, respectively. For comparison, the width of the Na(KLL) Auger transition is close to 0.26 eV. Widths for the transitions Na(1s)Na(2p)F(2p) and Na(2p)F(2p)F(2p)′ can be inferred from experimental data. Theory and experiment agree to within 50%. This represents a considerable improvement over previous theoretical treatments. 10 refs.

50820 (SAND—87-2320C) Laser spectroscopy and gas-phase chemistry in CVD. Ho, P.; Coltrin, M.E.; Beiland, W.G. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 3p. (CONF-871125—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013715.

From 34. national vacuum symposium and topical conference; Anaheim, CA, USA (2 Nov 1987).

A coordinated program of experimental and theoretical research into the fundamental mechanisms of CVD is described. The experimental part of the program involves the use of laser spectroscopic techniques for in situ measurements during CVD. The theoretical part of the program consists of a computer model that contains a detailed description of the coupled fluid mechanics and gas-phase chemical kinetics for silane CVD. 8 refs.

50821 (UCRL—96561-Rev.1) Phase transition of multifractals. Duong-van, M. (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 9p. (CONF-8704203—1-Rev.1; CONF-870159—4-Rev.1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014344.

From International workshop on nonlinear phenomena chaos in education; Balaton, Hungary (26 Apr 1987).

The nature of phase transition of the Logistic Map is studied. Using the Ising model as an analogy, we identify the set variables with the thermodynamic variables and calculate the specific heat of this set. The calculated specific heat varies logarithmically with the lattice size, in agreement with the lattice calculation results of Ferdinand and Fisher. The finite height and width of the specific heat of the set is shown to be a consequence of the finite lattice spacing. 7 refs.

50822 Determination of structural instabilities of atomic lattices by means of a Monte Carlo simulation. Taylor, P.A.; Dodson, B.W. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6673-6676(15 Oct 1987). Contract AC04-76DP00789.

We report studies using a simulation technique based on the Monte Carlo method to detect mechanical instabilities of atomic lattices when subjected to various strain histories. As an example of the technique, the zero-temperature mechanical behavior of an initially perfect two-dimensional Lennard-Jones lattice, while subjected to a varying axial strain, is investigated. Requiring only that the interatomic potential be specified, this technique has the advantage over previous schemes in that it does not rely on assumptions concerning the type of deformation imposed upon the lattice.

50823 Observation of a dynamical propensity rule in rotationally inelastic gas-surface scattering: NH_3 on Au(111). Kay, B.D.; Raymond, T.D.; Coltrin, M.E. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review [Section] B: Condensed Matter;* **36**: No. 12, 6695-6697(15 Oct 1987). Contract AC04-76DP00789.

We have measured rotational state distributions for NH_3 scattered from Au(111) using multiphoton-ionization laser spectroscopy. The NH_3 exhibits a strong propensity to scatter into the lowest-K states; these are states in which the molecule is tumbling normal to the molecular symmetry axis as opposed to spinning about it. Additionally, the scattered rotational distribution exhibits a sharp feature near zero rotational energy indicative of a rotational rainbow.

50824 Interatomic potentials in condensed matter via the maximum-entropy principle. Carlsson, A.E. (Department of Physics, Washington University, St. Louis, Missouri 63130). *Physical Review Letters;* **59**: No. 10, 1108-1111(7 Sep 1987).

A general method is described for the calculation of interatomic potentials in condensed-matter systems by use of a maximum-entropy Ansatz for the interatomic correlation functions. The interatomic potentials are given explicitly in terms of statistical correlation functions involving the potential energy and the structure factor of a "reference medium." Illustrations are given for Al-Cu alloys and a model transition metal.

50825 Ion and neutral atomic and cluster sputtering yields of molybdenum. Pellin, M.J.; Husinsky, W.; Calaway, W.F.; Burnett, J.W.; Schweitzer, E.L.; Young, C.E.; Jodash-barrgensen, B.; Gruen, D.M. (Materials Science and Chemistry Divisions, Argonne National Laboratory, Argonne, Illinois 60439). *Journal of Vacuum Science and Technology, B: Microelectronics Processing and Phenomena;* **5**: No. 5, 1477-1481(Sep 1987). Contract W-31-109-ENG-38.

The yield of neutral and ionized Mo, Mo_2, and Mo_3 sputtered from a Mo target by 4-keV Ar^+ has been measured in the surface analysis by resonance ionization of sputtered atoms (SARISA) machine. Ionization spectroscopy combined with time-of-flight (TOF) secondary ion mass spectrometry (SIMS) allowed us to obtain for the first time absolute sputtering yields and ionization fractions of sputtered atoms and metal clusters. Unlike sputtered atomic species, Mo clusters have been found to be sputtered with large ion fractions. The sputtering yield of Mo clusters is very sensitive to oxygen on the surface, i.e., even small amounts of oxygen on the surface identified by Mo^+ and MoO^+ peaks in the SIMS spectrum, reduce the cluster yield substantially. A broad structureless absorption band was observed for sputtered Mo_2 molecules indicating substantial rovibronic excitation as predicted by theoretical models.

50826 Buerger precession camera and overall characterization of thin films and flat-plate crystals. Staudenmann, J.L.; Horning, R.D.; Knox, R.D. (Ames Lab., IA, USA. Dept. of Physics; Iowa State Univ. of Science and Technology, Ames, USA). *Journal of Applied Crystallography;* **20**: No. 3, 210-221(1 Jun 1987). Contract W-7405-ENG-82.

A fast simple and non-destructive method is described to provide qualitative structural information for flat-plate crystals and epitaxically grown films. The technique, based upon the Buerger precession camera, produces an easy-to-interpret photograph of the reciprocal space of all the components at once: substrate, film or buffer layer, and/or superlattice. A wide variety of technologically important examples are used to illustrate the technique: a mixture of CdTe phases on (001) Si, an aluminium layer on a (001) Si substrate, (001) Ge epitaxic layers on (001) Si substrates, three combinations of possible orientations of CdTe epitaxic layers on various substrate types, CdTe/ZnTe and other II-VI superlattices on GaAs substrates. In addition, the precession pictures readily reveal the common [111] face-centered cubic twin fault, or stacking disorder, seen in bulk growth methods. This finding may have severe consequences for the electronic mobility and the feasibility of devices fabricated from these composite systems.

6561 Superconductivity

REFER ALSO TO CITATION(S) 49857, 49860, 49874, 49875, 49877, 49878

50827 **(CNIC—00033) Study of the performance testing on the superconductor joining.** Li Huanxing; Liu Jianmin; Tang Benzeng; Wang Baomu. (China Nuclear Information Centre, Beijing, BJ). 1986. 5p. (In Chinese). (SIP—0012). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703400.

Superconductor joining is one of the key techniques of developing superconducting magnets for various purposes. For evaluating the performance of a superconductor joining, some properties, such as electromagnetic and mechanical, must be measured. The principle and method for measuring the resistance under zero background magnetic field, critical current density and mechanical intensity are presented and some results are given. The superconductor joining resistance can be measured down to 10/sup -3/ Ω by using the double Hall probe and by the decay method. The critical current density and mechanical intensity all meet the demands of making various superconducting magnets.

50828 **(CNIC—00054) Anomalous phonon behavior of superconductor Y-Ba-Cu-O.** Ruan Jinghui; Li Jizhou; Yu Ansun; Gan Shu; Niu Shiwen; Gou Chen; Ye Chuntang; Liu Zhenyi; Zheng Xiangmiao; Lin Bingxiong. (China Nuclear Information Centre, Beijing, BJ). 1987. 5p. (In Chinese). (IAE—0016). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703401.

The generalized phonon density of states of Y-Ba-Cu-O superconductor (T/sub c/ = 90.5 K) have been measured at 289 K and 87 K respectively, by using Be filter detector neutron inelastic scattering spectrometer at Institute of Atomic Energy. At 87 K, the optical mode at 76 MeV which is estimated owing to Cu-O-Cu breathing mode and a stronger acoustic mode below 6 MeV are observed, and the low frequency modes at 10 MeV and 19 MeV in 289 K seems to be disappeared, or to be softened. It is possible that the anomalous change of phonon density of states below T/sub c/ is responsible for the higher supercondcuting transition temperature of Y-Ba-Cu-O.

50829 **On the relation between the energy gap and the critical temperature.** Kresin, V.Z. (Lawrence Berkeley Lab., CA, USA). *Solid State Communications;* **63**: No. 8, 725-727(Aug 1987).

It is shown that the ratio β = epsilon/Tsub(c) (epsilon is the energy gap at T = OK) saturates with increasing strength of the electron-phonon interaction; the value βsub(max) is calculated. The special case of a multigap superconductor is discussed. New high-Tsub(c) superconductors present a unique opportunity to observe a multigap structure.

6570 Theoretical And Mathematical Physics

REFER ALSO TO CITATION(S) 50001, 50355, 50357, 50358, 50479

50830 **(CBPF-MO—003/86) Lectures on general relativity.** Lopes, J.L. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 212p. (In French). NTIS (US Sales Only), PC A10/MF A01. File Number DE87703350.

Lectures on General Relativity Theory, at an introductory level, given by the author at the University of Strasbourg is presented. (S.D.).

50831 **(CBPF-NF—013/86) Phenomenological quantization scheme in nonlinear Schroedinger equation.** Maki, J.N.; Kodama, T. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703355.

A phenomenological quantization scheme is carried out for the collision process of two identical solitons of the nonlinear Schroedinger equation. The effective potential is determined from the classical expression for the time-delay, and the corresponding S matrix is calculated for the quantum scattering of the two centers of mass of solitons. It is shown that this S matrix reproduces the exact S matrix of the quantum many body problem as well as the ground state binding energy of the system for large particle number, but it is not adequate to describe the scattering process for low energy region.

50832 **(CBPF-NF—033/86) Non-minimal interaction of gravity with other physical fields: an overview.** Novello, M.; Oliveira, L.A.R. de. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 34p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703362.

A review on some modern developments concerning the interaction of gravity with other physical fields. It is argued that a suitable context for an account of their dynamical interplay is that of the non-minimal (e.g., conformal) coupling of these fields to gravity. Some interesting features of non-minimal coupling, such as the connection with Weyl-integrable spacetime (WIST) structure, the generation of eternal Universes, the appearance of a cosmological constant and the possible induction of repulsive gravity via spontaneous symmetry breaking (SSB) mechanisms, are discussed. In particular, examines a simple case of strong interacting scalar particles (such as the well-Known elastic reaction PIK -> PIK), in a curved background, thereby obtaining the curious result that the actual, observed value of the strong coupling constant and the minimum value allowable, in order to preclude antigravity, are related by Eddington's number 10/sup 39/.

50833 **(CBPF-NF—039/86) Example of correlation between space and spin coordinates.** Helman, J.S. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 25p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703366.

An elementary, exactly solvable, quantum mechanical model in which space and spin coordinates are correlated is fully developed. It clearly illustrates aspects which are seldom treated in elementary courses. Furthermore, it provides simple examples for the concepts of bonding, antibonding, Franck-Condon effect and effective spin-spin interaction.

50834 **(CBPF-NF—041/86) Computer-aided study of a class of Riemannian space-times.** Reboucas, M.J.; Aman, J.E. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 22p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703367.

The Riemannian Goedel-type manifolds are examined in the light of the eequivalence problem techniques by using algebric computing. The conditions for space-time homogeneity of a Riemannian manifold with a Goedel-type metric are derived, generalizing previous work on this subject matter. A classification of the Goedel-type Riemannian manifolds based on two relevant parameters m and Ω is formulated. It is shown that apart from the m/sup 2/=4Ω/sup 2/ case they are all Petrov type D with a five-parameter group of motions. The special m/sup 2/=4Ω/sup 2/ manifold is shown to be conformally flat and to admit a seven-parameter group of isometries. An algebric classification of the Ricci spinor of all Goedel-type Riemannian manifolds is discussed. Possible sources for these space-times are examined. A geralization of the Reboucas-Tiomno theorem on Goedel-type manifolds given.

50835 **(CBPF-NF—042/86) On deviations from Newton's law and the proposal for a 'Fifth Force'.** Ferreira, L.A.; Malbouisson, A.P.C. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 49p. (IFT-P—12/86). NTIS (US Sales Only), PC A03/MF A01. File Number DE87703368.

The results of geophysical and laboratory measurements of Newton's constant of gravitation, seem to disagree by one percent. Attempts to explain this have led to the revival of the proposal for a fifth interaction in Nature. The experimental results on measurements of G and tests of Newton's inverse square law are reviewed. The recent reanalysis of the Eoetvoes experiment and proposals for new experiments are discussed.

50836 **(CBPF-NF—046/86) Analysis of absolute space-time Lorentz theories.** Maciel, A.K.A.; Tiomno, J. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1986. 22p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703371.

Two particular forms of absolute space time theories are presented together with a derivation of their predictions for measurements that are within presented day detection limits.

50837 **(IFUSP-P—574) Nonlinear electrodynamics via gravitational nonminimal coupling.** Accioly, A.J.; Silva, N.L.P.P. da. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Mar 1986. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703422.

A nonlinear electrodynamics is generated via gravitational nonminimal coupling. As a result, a neutral test particle will not follow geodesics on the whole. A general static spherically symmetric solution is also obtained. An interesting feature of the solution is the presense of a parameter similar to the 'Schwarzschild radius', which separates the solutions with a negative 'effective Einstein constant' from those with a positive one.

50838 **(IFUSP-P—577) Scalar-tensor theory of fourth-order gravity.** Accioly, A.J.; Goncalves, A.T. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Apr 1986. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703423.

A scalar-tensor theory of fourth-order gravity is considered. Some cosmological consequences, due to the presence of the scalar field, as well as of metric derivatives higher than second order, are analysed. In particular, upperbpunds are obtained for the coupling constant α and for the scale factor of the universe, respectively. The discussion is restricted to Robertson-Walker universes.

50839 (INIS-BR—688, pp 194) **Variational equations for classical-quantum dynamics.** Amaral, C.M. do; Joffily, S. (Rio de Janeiro Univ., Brazil. Inst. de Fisica; Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50840 (INIS-BR—688, pp 199) **Dynamic of correlations in a degenerate Fermi gas.** Carlson, B.V.; Nemes, M.C.; Toledo Piza, A.F.R. de. (Centro Tecnico Aeroespacial, Sao Jose dos Campos, Brazil. Inst. de Estudos Avancados; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50841 (INIS-BR—688, pp 201) **Coefficients of transformation between canonical and Elliot chains from SU(3) group.** Alcaras, J.A.C.; Vanagas, V. (Instituto de Fisica Teorica, Sao Paulo, Brazil; AN Litovskoj SSR, Vilnyus. Inst. Fiziki). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50842 (INIS-BR—688, pp 208) **Calculation of transition probabilities with Weyl-Wigner semiclassic method.** Galetti, D.; Eiras, A. 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50843 (INIS-BR—688, pp 211) **Semiclassical limit of a body nuclear dynamic.** Galetti, D.; Mizrahi, S.S.; Nemes, M.C.; Toledo Piza, A.F.R. de. (Instituto de Fisica Teorica, Sao Paulo, Brazil; Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50844 (INIS-BR—688, pp 222) **Master equation with memory effects.** Mizrahi, S.S.; Oliveira, S.A.C. de; Brinati, J.R. (Instituto de Fisica Teorica, Sao Paulo, Brazil; Rio de Janeiro Univ., Brazil). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

50845 (INIS-BR—746, pp 301-314) **Critical discussion of the trinucleon ground state with various trinucleon forces.** Coelho, H.T.; Las, T.K.; Robillota, M.R.; Isidro Filho, M.P. (Pernambuco Univ., Recife, Brazil. Dept. de Fisica; Burdwan Univ., West Bengal, India; Sao Paulo Univ., Brazil. Inst. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The contributions to the trinucleon ground state of different forms of pion-pion exchange three nucleon forces, including one derived by us are calculated and compared. The role of these forces is discussed critically. The Hyperspherical Harmonic method is used, which allows Coulomb and three nucleon forces to be treated nonperturbatively.

50846 (INIS-BR—746, pp 315-325) **Study of the virtual state of the triton and related observables with a three-nucleon force.** Delfino, A. (Pernambuco Univ., Recife, Brazil. Dept. de Fisica). May 1984. NTIS (US Sales Only), PC A17/MF A01. File Number DE87703498. (CONF-8405363—).

From 5. national meeting on intermediate energy physics; Gramado, Brazil (7 May 1984).

The binding energy E/sub T/, the energy E/sub V/ of the virtual state of the triton as well as the n-d doublet scattering length a/sub 2/ are calculated. The dependence of these quantities with the three-nucleon force (Tucson Potential) is investigated.

50847 **(JINR—R-11-86-329) Some features of the motion of charged particles in magnetic field of dipole configuration with stochastic instability.** Amirkhanov, I.V.; Zhidkov, E.P.; Il'ina, A.N.; Il'in, V.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1986. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703627.

Features of the motion of a particle in the magnetic dipole field in the region of stochastic instability are investigated. Dimensions and type of the particle drain are determined with the help of trajectory computation depending on the value of adiabatic parameters. It is shown that in stochastic motion pseudo-trapping of particles and their temporal retention are possible. Deformation of the field can cause broadening of the energy spectrum of pseudo-trapped particles and transfer finite trajectory into infinite. 8 refs.; 13 figs.

50848 **(NIKHEF-H—87-1) Modified quantum mechanics of small composite systems.** Wolters, G.F. (Nationaal Inst. voor Kernfysica en Hoge-Energiefysica (NIKHEF), Amsterdam (Netherlands). Sectie H). Dec 1986. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703638.

Boundary conditions on radial wave functions are considered for a particle bound by a central potential. It is argued that the usual condition at the origin needs modification for systems of small intrinsic size. This affects s-states, especially the ground state. With the obtained modification the virial theorem is imposed rather than derived. As an illustration the central rectangular well potential is treated and applied to the nucleon. Its soft electromagnetic structure can be largely explained while quark confinement holds despite moderate strength of the potential. A discussion follows. (Auth.). 11 refs.; 4 figs.

50849 (PUC-TN—04/84) Experimental demonstrations of the properties of Fourier transforms using diffraction phenomena. Bazin, M.J.; Lucie, P.H.; Oliveira, S.M.M. de. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Fisica). 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703643.

The standard mathematical properties of Fourier transforms and the experimental characteristics of diffraction phenomena are systematically brought together. An experimental realization of a particular case of the convolution theorem is displayed in details.

50850 (SAND—87-1614C) A new method for measuring waveguide propagation losses. Brannon, P.J. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 6p. (CONF-8708110—14). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011305.

From 31. SPIE annual international technical symposium on optical and optoelectronic applied science and engineering; San Diego, CA, USA (16 Aug 1987).

We report a refinement of a previously reported method for measuring propagation losses in single-mode optical waveguides. The method as previously described applies to isotropic materials (glass); corrections are necessary when anisotropic materials, such as $LiNbO_3$, are used. This report describes the method and indicates two means for estimating the corrections for anisotropic materials.

50851 (UCRL—97268) Fully developed turbulence via Feigenbaum's period-doubling bifurcations. Duong-van, M. (Lawrence Livermore National Lab., CA (USA)). Aug 1987. Contract W-7405-ENG-48. 35p. (CONF-870159—3). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000242.

From International conference on physics of chaos and systems far from equilibrium; Monterey, CA, USA (11 Jan 1987).

Since its publication in 1978, Feigenbaum's predictions of the onset of turbulence via period-doubling bifurcations have been thoroughly borne out experimentally. In this paper, Feigenbaum's theory is extended into the regime in which we expect to see fully developed turbulence. We develop a method of averaging that imposes correlations in the fluctuating system generated by this map. With this averaging method, the field variable is obtained by coarse-graining, while microscopic fluctuations are preserved in all averaging scales. Fully developed turbulence will be shown to be a result of microscopic fluctuations with proper averaging. Furthermore, this model preserves Feigenbaum's results on the physics of bifurcations at the onset of turbulence while yielding additional physics both at the onset of turbulence and in the fully developed turbulence regime.

50852 (UFPA-NF—05/86) On the use of space-time transformations in path-integration. Nassar, A.B.; Bassalo, J.M.F.; Antunes Neto, H.S.; Alencar, P.deT.S. (Para Univ., Belem (Brazil). Dept. de Fisica). 1986. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703658.

It is demonstrated that the usage of a space-time transformation can enormously simplify the evaluation of the propagator for the problem of a particle with time-dependent mass, subject to a time-varying, forced harmonic oscillator potential. It is shown that such a propagator can be easily obtained from the free propagator in the new space-time coordinate system.

50853 (UFPB-DF—04/84A) Geometric formulation of Einstein-Maxwell theory in Einstein-Cartan space-time. Fonseca Neto, J.B. da; Rivelles, V.O. (Paraiba Univ., Joao Pessoa (Brazil). Dept. de Fisica). 1984. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703659.

A geometric theory is proposed for electrogametism and gravitation where the electromagnetic potential is introduced in the geometry through the torsion. An is first built action for dyon electrodynamics using the two potentials formulation in such a way it is equivalent to Maxwell theory if the ratio between electric and magnetic charges is an universal constant. Since the torsion can be decomposed into a trace, a pseudo-trace and a traceless part, the two potentials of the dyon elctrodynamics with the two traces of the torsion are identified and an action which reproduces the Einstein-Maxwell theory: Matter fields do not have a propor minimal coupling to this theory.

50854 (UFPB-DF—07/86) Hamiltonization of classical non-holonomic systems. Espindola, O.; Espindola, M.L.; Negri, L.J.; Teixeira, N.L. (Paraiba Univ., Joao Pessoa (Brazil). Dept. de Fisica). 1986. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703660.

A Hamiltonization for non-holonomic dynamical system is developed. One example is given.

50855 (UFPB-DF—11/86) Loop variables in Goedel and Friedmann universes. Bezerra, V.B. (Paraiba Univ., Joao Pessoa (Brazil). Dept. de Fisica). 1986. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703661.

The path ordered integrals for circular paths in Goedel and Friedmann gravitations are computed in a compact form. The corresponding Wilson loops are also computed.

50856 (UFPB-DF—12/86) Ambiguities in the Lagrangians formalism: the time-dependent case. Moreira, D.T. (Paraiba Univ., Joao Pessoa (Brazil). Dept. de Fisica). 1986. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703662.

An intrinsic formulation of the equivalence problem for time-dependent Lagrangians is given. A new demostration of a theorem derived by Henneaux (1982) is obtained. The relationship to transformation groups is discussed.

50857 (UFPB-DF—14/86) Canonical transformations and exact invariants for dissipative systems. Pedrosa, I.A. (Paraiba Univ., Joao Pessoa (Brazil). Dept. de Fisica). 1986. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703663.

A simple treatment to the problem of finding exact invariants and related auxiliary equations for time-dependent oscillators with friction is presented. The treatment is based on the use of a time-dependent canonical transformation and an auxiliary transformation.

50858 (UFPB-DF—15/86) Canonoid transformations and constants of motion. Negri, L.J.; Oliveira, L.C.; Teixeira, J.M. (Paraiba Univ., Joao Pessoa (Brazil). Dept. de Fisica). 1986. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703664.

The necessary and sufficient conditions for a canonoid transformation with respect to a given Hamiltonian are obtained in terms of the Lagrange brackets of the trasformation. The relation of these conditions with the constants of motion is discussed.

50859 Thermodynamic perturbation theory for multicomponent and polydisperse mixtures. Kincaid, J.M.; MacDonald, R.A.; Morrison, G. (Department of Mechanical Engineering, State University of New York at Stony Brook, Stony Brook, New York 11794). *Journal of Chemical Physics;* **87**: No. 9, 5425-5436(1 Nov 1987).

We describe a general perturbation method that can be used to solve the equilibrium and critical-point conditions for model systems described by an analytic Helmholtz free energy. The general technique is developed within the framework of continuous or polydisperse systems; it may be applied to systems with discrete components, as well as to systems described by a continuous distribution of components. The expansion is based on the assumption that the microscopic parameters characterizing the system may be expressed as those of a reference system plus a series of "small" corrections. Explicit formulas for the first- and second-order solutions to the equilibrium and critical-point conditions are given. The low-order perturbation solutions will be useful when the phase boundaries of the system are close to those of the reference system.

50860 Radiation of elliptical and bicylindrically focused piston transducers. Thompson, R.B.; Gray, T.A.; Rose, J.H.; Kogan, V.G.; Lopes, E.F. (Ames Laboratory, Iowa State University, Ames, Iowa 50011). *Journal of the Acoustical Society of America;* **82**: No. 5, 1818-1828(Nov 1987).

Expressions for the radiation of elliptical and bicylindrically focused piston transducers are derived within the Fresnel approximation. For the axial fields, the result takes the form of either a simple analytical expression (small perturbations from the circular piston case), a single quadrature in a real variable (unfocused and some focused cases), or a single quadrature in a complex variable (near focal points). The full fields are represented by a series of localized, Gauss—Hermite eigenfunctions. Numerical examples are used to illustrate the agreement of the two solutions for on-axis fields and to shed light on questions of the convergence and the selection of initial scaling parameters of the Gauss—Hermite expansion.

50861 Determination of the A parameter in supergravity models from $Z^0 \rightarrow$ two gluinos. Rolnick, W.B. (Department of Physics, Wayne State University, Detroit, Michigan 48202). *Physical Review [Section] D: Particles and Fields;* **36**: No. 7, 2052-2055(1 Oct 1987).

How information about the A parameter in supergravity models may be obtained from the decay $Z^0 \rightarrow$g-tildeg-tilde is shown. It is found that for Anot $=0$ the branching ratio is modified and a new helicity state of the gluinos is produced. The contribution from the 1^- part of the Z^0 coupling [and therefore from the U(1) part] is shown to be zero for complete mixing of the left- and right-handed squarks. Theorems which forbid the new helicity state and the 1^- contribution in the case of no mixing and equal mass for the left- and right-handed squarks are proven. Numerical calculations are done in the Quiros-Kane-Haber supergravity model as an example.

50862 Topology, parallelism and infrared fixed points. Curtright, T.L.; Zachos, C.K. (Univ. of Florida-Gainesville, FL). pp 478 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

Supersymmetric chiral models which include Wess-Zumino interaction terms are constructed, analyzed, and interpreted in terms of torsion on the field manifold. On loop renormalization results are presented geometrically, revealing that an infrared fixed point exists when the torsion parallelizes the manifold. These general results also hold in the absence of fermions, and are illustrated in Phys. Rev. Lett. 53 (1984) 1799, and in a longer forthcoming publication.

50863 The N=2 Maxwell/Einstein supergravity theories and their compact and non-compact gaugings. Gunaydin, M. (California Institute of Technology, Pasadena, CA 91125). pp 420-423 of Proceedings of the Santa Fe meeting of the Division of Particles and Fields of the American Physical Society. Goldman, T.; Nieto, M.M. Teaneck, NJ; World Scientific Pub. Co. (1985). (CONF-8410222—).

From American Physical Society meeting; Santa Fe, NM, USA (31 Oct 1984).

The construction and classification of N=2 Maxwell/Einstein supergravity theories and their compact and non-compact gauging is reviewed.

70 FUSION ENERGY

REFER ALSO TO CITATION(S) 49617, 50404, 50520

50864 (IPPJ-REV—2) Statistical plasma physics: proceedings of workshop of US-Japan joint institute for fusion theory program. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Sep 1986. vp. (CONF-8602116—). NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166.

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Individual papers have been cataloged separately. (WRF)

50865 The man-made Sun: The quest for fusion power. Heppenheimer, T.A. Boston, MA; Little Brown and Company (1985). 347p. Little Brown and Company, 34 Beacon St., Boston, MA 02106.

This book provides an account of the efforts since the 1970s to produce energy by nuclear fusion. Simplified descriptions of the technical features of the process are provided and the author has given more emphasis to the political forces influencing research efforts.

7001 Plasma Research

REFER ALSO TO CITATION(S) 50043, 50979, 51001

50866 (CNIC—00022) Effect of residual field on lower hybrid wave current drive. Ding Houchang; Zhu Yonkang. (China Nuclear Information Centre, Beijing, BJ). 1986. 10p. (In Chinese). (SIP—0001). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703389.

Considering the kinetic process of the lower hybrid wave in plasma, the effect of the residual field on the current drive is investigated. The wave-driven current can be increased by enhancing the residual field; but the power consumed by the wave will be increased even more; therefore the efficiency of the lower hybrid wave current drive decreases while the residual field increases.

50867 (CNIC—00023) Anomalous slowing down mechanism for ion current during the injection of high energy neutral beam. Guo Shuyin. (China Nuclear Information Centre, Beijing, BJ). 1986. 6p. (In Chinese). (SIP—0002). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703390.

In this paper, it is pointed out that there may be an anomalous slowing down mechanism for ion current instead of Fokker-Planck scattering during the injection of a neutral beam when the injection energy is very high. The slowing down time tau/sub s/ for classical and anomalous mechanism has been derived. The relation between the slowing down time tau/sub s/ and the velocity U/sub ib/ of ion beam in the two kinds of mechanism is quite different. The change rate of the kinetic energy E/sub parallel/ and E/sub perpendicular/, which respectively parallel and perpendicular to magnetic field B/sub 0/ are calculated. When the injection direction is nearly perpendicular to B/sub 0/ dE/sub parallel//dt>0 and dE/sub perpendicular//dt<0 are obtained because of the electromagnetic instability with K parallel to B/sub 0/.

50868 (CNIC—00025) HL-1 preliminary experiments. Qin Yunwen; Xu Guangbi; Li Youyi. (China Nuclear Information Centre, Beijing, BJ). 1986. 14p. (In Chinese). (SIP—0004). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703392.

A stable equilibrium plasma with the current of 135 kA and the plateau time of 150 ms have been obtained on HL-1 TOKAMAK which operates at the toroidal magnetic field of 2.3 T. The electron temperature is approximately 500 eV, electron density is 2.3 x 10/sup 13/ cm/sup -3/, energy confinement time reaches 10 ms, effective charge number less than 3 and minimum safety factor for stable operation is 2.5. The experimental results show that the stray component of the toroidal magnetic field is only about hundred millionth, and the equilibrium magnetic field with the copper shell can sustain the plasma equilibrium. The discharge lasts time can reach 1.04 sec. On the basis of detail observation on MHD instability, the stable operation region have been determined; the critical density is consistent with Murakami scaling under present ohmic heating condition the energy confinement time obeys Alcator C scaling. A detail analysis and discussion on the experimental results is given.

50869 (CNIC—00026) Investigation of the vacuum ultraviolet spectra of plasma in HL-1 device. Li Kehua; Luo Cuixian; Yuan Wenlin; Zhang Shuxun. (China Nuclear Information Centre, Beijing, BJ). 1986. 9p. (In Chinese). (SIP—0005). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703393.

The measurements of vacuum ultraviolet spectra (300-2000 A) of plasma in HL-1 device are described. Majority of plasma spectra recorded by MCP image intensifier have been identified. The plasma spectra, impurities, impurity sources, spectral phenomena caused by small disruption and impurty development produced by changing limiter radius is analysed. Electron temperature of HL-1 plasma at the moment of initial discharging has been determined by measuring the relative intensities of lines from the same element and the same ionization stage.

50870 **(CNIC—00027) Electron cyclotron resonance heating experiments on magnetic mirror device MM-2.** Guan Weishu; Cheng Shiquing; Xing Dazhong; Duan Shuyun; Wang Jinhe; Chen Dingguo. (China Nuclear Information Centre, Beijing, BJ). 1986. 9p. (In Chinese). (SIP—0006). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703394.

The electron cyclotron resonance heating experiments have been carried out on a simple magnetic mirror device (MM-2). The intensity of the magnetic field in the center of the device is around 3 x 10/sup -1/ T. The mirror ratio equals to 2.64:1. The mirror space is 60 cm. The inner diameter of the vacuum chamber is 20 cm. The plasma is produced and heated by the microwave radiation fed into the chamber radially in the midplane. The microwave power source is a gyrotron which produces 30 kW output power in 15 GHz frequency within 10 ms pulse duration. The hard X-ray signal is observed while the diamagnetism signal appars. The analysis of the bremsstrahlung emission shows that the temperature of the hot electron is about 25-30 KeV. The electron densit measured by the multigrid energy analyzer is about (1.1-3.9) x 10/sup -3/.

50871 **(CNIC—00028) Investigations of electrostatic plugging in cusp device.** Tian Zhongyu; Min Linzhou. (China Nuclear Information Centre, Beijing, BJ). 1986. 11p. (In Chinese). (SIP—0007). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703395.

An electrostatically plugged cusp plasma confinement device and the experimental methods are described. The experimental results of the electron injection, the function of plugging electrode and the performance of plasma confinement are given, and had been analysed and discussed. Main results are as follows: plasma density n, confinement time tau, electron temperature T/sub e/ and plasma potential phi/sub p/ are around 2 x 10/sup 10/ cm/sup -3/, 2 ms, 50 eV and -68 V respectively. Scaling relation between the plasma density and magnetic field has been proved experimentally. The function of plugging electrode is obvious and effective. The main results agree with the theory involved. This system can be used to study the plasma accumulation and heating, potential shielding and electrostatical end plug of axial symmetric tandem mirrors.

50872 **(CNIC—00029) Heating and injection experiments of the CF-II plasma toroid.** Wang Guiyi; Wang Shizhong; Xu Xingjian. (China Nuclear Information Centre, Beijing, BJ). 1986. 6p. (In Chinese). (SIP—0008). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703396.

The heating and injection experiments of the CF-II are to heat the plasma by axial shock and then to inject it into the confinement region using the plasma toroid produced by the field reversed θ-pinch in order to extend the confinement time of the plasma toroid. The parameters of the plasma toroid in the forming region are as follows: toroid radius R/sub s/ = 4 cm; prolongable length L/sub s/ = 40 cm; electron density n/sub e/ = 10/sup 15/ cm/sup -3/; electron temperature T/sub e/ = 20 eV and the confinement time tau = 30 μs. The transmission velocity from the forming region into the confinement region is 7.8 x 10/sup 6/ cm/sec. The electron temperature after heating is about 34 eV.

50873 **(CNIC—00032) Ohmic heating power supply system for HL-1 Tokamak.** Ze Mingrui; Gao Yunxia; Xie Jiangfu; Wang Shangbing; Cheng Jiashun; Tang Huiting; Tang Juechun. (China Nuclear Information Centre, Beijing, BJ). 1986. 7p. (In Chinese). (SIP—0011). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703399.

A novel circuit is used in the ohmic heating power supply system for HL-1. The wavefront of the primary current with high power is set by the discharge of capacitor banks and can be adjusted between 2 to 12 ms, and the flat top is sustained for more than 2 seconds by a DC flywheel generator set and energy storage inductor. The principle and technical characteristics of the circuit are described and the main parameters of the system are given. The effect of the circuit is discussed, according to the result of the adjustment and the primary test of the system.

50874 **(CONF-870457—4) Applications of neutral beam and rf technologies.** Haselton, H.H. (Oak Ridge National Lab., TN (USA)). Apr 1987. Contract AC05-84OR21400. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014936.

From Annual meeting of Fusion Power Associates; Pleasanton, CA, USA (8 Apr 1987).

This presentation provides an update on the applications of neutral beams and radiofrequency (rf) power in the fusion program; highlights of the ion cyclotron heating (ICH) experiments now in progress, as well as the neutral beam experiments; and heating requirements of future devices and some of the available options. Some remarks on current drive are presented because this area of technology is one that is being considered for future devices.

50875 **(DOE/ER—0333) Science Court on ICRH [ion cyclotron resonance heating] modeling of tokamak plasmas.** Hively, L.M.; Sadowski, W.L. (Oak Ridge National Lab., TN (USA)). Oct 1987. Contract AC05-84OR21400. 88p. (ORNL/M—425). NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE88000347.

The Applied Plasma Physics (APP) Theory program in the Office of Fusion Energy is charged with supporting the development of advanced physics models for fusion research. One such effort is ion cyclotron resonance heating (ICRH), which has seen substantial progress recently. However, due to serious questions about the adequacy of present models for CIT (Compact Ignition Tokamak), a Science Court was formed to assess ICRH models, including: validity of theoretical and computational approximations; underlying physics assumptions and corresponding limits on the results; self-consistency; any subsidiary issues needing resolution (e.g., new computer tools); adequacy of the models in simulating experiments (especially CIT); and new or improved experiments to validate and refine the models. The Court did not review work by specific individuals, institutions, or programs, thereby avoiding any biases along these lines. Rather, the Science Court was carefully structured as a technical review of ICRH theory and modeling in the US. This paper discusses the Science Court process, findings, and conclusions.

50876 **(DOE/ER/53198—111) Neoclassical currents in the Wisconsin Levitated Octupole.** Painchaud, S.V. (Wisconsin Univ., Madison (USA). Plasma Physics Research). Aug 1987. Contract FG02-85ER53198. 65p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000447.

Neoclassical transport theory predicts the existence of bootstrap current in collisionless plasmas with a significant population of trapped particles. This unidirectional current flows along field lines, and is generated by the balancing of ion-electron friction forces with the viscous forces between trapped and untrapped like particles. The current is driven by gradients in the plasma pressure and temperature. Previous work has identified the existence of bootstrap current in the Wisconsin Levitated Octupole, and this discovery of bootstrap current in the octupole naturally leads to the question of why previous experiments were unsuccessful in their endeavors to identify this current. The original motivation for this thesis was to address that question, by investigating the effects on bootstrap current caused by ohmic currents, plasma fluctuations, and rf fields. Ohmic currents, while naturally present in tokamaks, can be introduced in the octupole, independent of the usual operating procedure, and can be adjusted to be of the same order of magnitude as the expected diamagnetic and parallel currents. The interaction, if any, of bootstrap current and ohmic current can thus be determined without the problem of a large ohmic current masking the neoclassical current. Rf fields can be driven in the octupole plasma with little or no plasma heating. Any anomalous effects on the parallel currents, due to the existence of the rf fields, can then be determined. This thesis consists of four parts: the experimental apparatus and the plasma diagnostics used in these studies; the gen-

eral theory of neoclassical currents (excluding field errors) and how it is applied to the octupole; the experimental results of this investigation; and a brief discussion of the conclusions that can be inferred from the data.

50877 **(DOE/ER/53223—45) Wave propagation across ion cyclotron resonance harmonic layers.** Imre, K.; Weitzner, H. (New York Univ., NY (USA). Courant Inst. of Mathematical Sciences). Aug 1987. Contract FG02-86ER53223. 69p. (MF—116). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000202.

Wave propagation across ion cyclotron resonance layers is investigated by use of a boundary layer analysis for a perpendicularly stratified, weakly inhomogeneous plasma. Corresponding to the situation in many plasmas of interest, it is assumed that the wave frequency is much less than the ion plasma frequency, but that the ratio of ion plasma frequency to wave frequency times the ratio of ion thermal speed to the speed of light is small. Non-trivial effects of the cyclotron resonance appear in the boundary layer and modify the current from the cold plasma limit. These corrections suggest the breakdown of the geometrical optics limit. Wave equations for the field valid within an arbitrary harmonic resonance layer are derived, as well as for the two ion hybrid resonance case. Analytical proofs of reciprocity relations are given for the general wave propagation problems. For fundamental resonance, second harmonic resonance, and ion-ion hybrid resonance proofs of the properties that the transmission coefficient remains the same as its geometrical optics value, and the absence of reflection of the fast mode incident from the high field side are given. Numerical results for the cases of fundamental, second, and third ion resonances, and for the ion-ion hybrid resonance are presented.

50878 **(DOE/ET/53088—298) Stability of low-shear tokamaks.** Waelbroeck, F.L.; Hazeltine, R.D. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Sep 1987. Contract FG05-80ET53088. 19p. (IFSR—298). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000305.

It has been suggested that the recently observed fast sawtooth crashes are caused by a low-shear, pressure-driven ideal instability. This hypothesis is investigated, using asymptotic methods to solve the toroidal mode equations for a class of equilibria characterized by a low-shear central region in which q - 1 is small, separated from the wall by a region with finite shear. A dispersion relation which differs significantly from previous results is obtained. An explicit expression for the growth rate is given for a model q profile.

50879 **(DOE/ET/53088—300) Renormalized perturbation theory: Vlasov-Poisson System, weak turbulence limit and gyrokinetics.** Zhang, Y.Z.; Mahajan, S.M. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Oct 1987. Contract AS05-85ER53193;FG05-80ET53088. 27p. (IFSR—300). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000307.

The Self-consistency of the renormalized perturbation theory is demonstrated by applying it to the Vlasov-Poisson System and showing that the theory has the correct weak turbulence limit. Energy conservation is proved to arbitrary high order for the electrostatic drift waves. The theory is applied to derive renormalized equations for a low-β gyrokinetic system. Comparison of our theory with other current theories is presented. 22 refs.

50880 **(IFUSP-P—565) Magnetic islands created by resonant helical windings.** Fernandes, A.S.; Heller, M.V.; Caldas, I.L. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Jan 1986. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703414.

The triggering of disruptive instabilities by resonant helical windings in large aspect-ratio tokamaks is associated to destruction of magnetic surfaces. The Chirikov condition is applied to estimate analytically the helical winding current thresholds for ergodization of the magnetic field lines. (Autor).

50881 **(INIS-BR—675) Microwave plasma mode conversion.** Torres, H.S.; Sakanaka, P.H.; Villarroel, C.H. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1985. 4p. (CONF-8507162—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703435.

From International symposium on microwave technology in industrial development; Campinas, Brazil (22 Jul 1985).

The behavior of hot electrons during the process of laser-produced plasma is studied. The basic equations of mode conversion from electromagnetic waves to electrostatic waves are presented. It is shown by mode conversion, that, the resonant absorption and parametric instabilities appear simultaneously, but in different plasma regions. (M.C.K.).

50882 **(INIS-BR—683) Electrostatic probes in luminescent discharges.** Cunha Raposo, C. da. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). 1980. 99p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703443.

A system to produce luminescent type plasma by continuos discharge and ionization by high frequency was constructed. The ionization was done in the air and in the argon under pressures from 3 to 10 mmHg. The parameters of a non magnetized collisional plasma and the parameters of a magnetized plasma such as, density, eletron temperature and potential, using a Langmuir probe with plane geometry, were determined. (M.C.K.).

50883 (INIS-BR—688, pp 99) **Instabilities and oscillations in tokamaks.** Caldas, I.L. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1984. (In Portuguese). NTIS (US Sales Only), PC A13/MF A01. File Number DE87703448. (CONF-8409401—).

From 7. workshop on nuclear physics; Itatiaia, RJ, Brazil (1 Sep 1984).

It is presented the importance of the study of magnetic instabilities and oscillations in tokamaks, their main experimental characteristics and some theoretical interpretations. (M.C.K.).

50884 **(INIS-mf—10688) Laser light scatter experiments on plasma focus plant.** Wenzel, N. (Heidelberg Univ. (Germany, F.R.). Naturwissenschaftlich-Mathematische Gesamtfakultaet). 1985. 95p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87752880.

The plasma focus plant is an experiment on nuclear fusion, which is distinguished by a high neutron yield. Constituting an important method of diagnosis in plasma focussing, the laser light scatter method makes it possible, apart from finding the electron temperature and density, to determine the ion temperature resolved according to time and place and further, to study the occurrence of micro-turbulent effects. Starting from the theoretical basis, this dissertation describes light scatter measurements with ruby lasers on the POSEIDON plasma focus. They are given, together with earlier measurements on the Frascati 1 MJ plant and the Heidelberg 12 KJ plant. The development of the plasma parameters and the occurrence of superthermal light scatter events are discussed in connection with the dynamics of the plasma and the neutron emission characteristics of the individual plants. The results support the view that the thermo-nuclear neutron production at the plasma focus is negligible. Although the importance of micro-turbulent mechanisms in producing neutrons cannot be finally judged, important guidelines are given for the spatial and time relationships with plasma dynamics, plasma parameters and neutron emission. The work concludes with a comparison of all light scatter measurements at the plasma focus described in the literature.

50885 **(INIS-mf—10971) Proceedings of the 17. International conference on phenomena in ionized gases held in Budapest, Hungary, July 8-12, 1985. Invited papers.** Bakos, J.S.; Soerlei, Zsuzsa (eds.). (Eoetvoes Lorand Fizikai Tarsulat, Budapest (Hungary); Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Mar 1986. 361p. (CONF-850718—). NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562.

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

The invited papers of the 17. International conference on phenomena in ionized gases are published containing papers on kinetic theory of ionized gases. The topics cover plasma kinetics, plasma diagnostic methods, arc and discharge physics, magnetic properties of plasmas, new plasma models, laser-plasma physics, and transport phenomena in ionized gases. (D.Gy.).

50886 (INIS-mf—10971, pp 120-136) **Nonideal plasmas - experimental research.** Guenther, K.; Hess, H.; Radtke, R. (Akademie der Wissenschaften der DDR, Berlin. Zentralinstitut fuer Elektronenphysik). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

The investigation of nonideal, strongly coupled, or non-Debye plasmas is a new field of the well-known arc plasma physics. The increased pressure and density cause different behaviour of the dense plasma. The paper surveys the main differences between the nonideal and the usual arc plasmas. The electrical conductivity, continuum radiation absorption coefficient, shift and broadening of spectral lines, and plasma phase transition are discussed. The problems of generation and diagnostics of nonideal plasmas are also described. Finally, the importance of the topic is underlined: possible applications in astrophysics and in different fields of technology: light sources, MHD generators, circuit breakers, laser mirrors and shutters, high temperature gas-phase fission reactors, material treatment and laser fusion are mentioned. (D.Gy.). 56 refs.; 14 figs.

50887 (INIS-mf—10971, pp 137-148) **Energy transport in laser produced plasmas.** Key, M.H. (Rutherford Appleton Lab., Chilton, UK). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

The structure of the surface layer of a solid irradiated by intense laser radiation generating surface plasma is surveyed. A general view is given about the pressure, temperature and hydrodynamical conditions in and near the irradiated surface. A detailed analysis is presented on the mechanism of energy transfer by thermal electrons and their interaction with plasma waves. Detailed models of thermal electron kinetics are described, the theoretical results are compared with experimental data. The emission of soft X-rays from the thermal conduction region is discussed in detail. Two additional phenomena: thermal smoothing of transverse spatial nonuniformities and the opposite effect, transverse thermal instability, leading to production of separate plasma jets, are also described. (D.Gy.). 23 refs.; 8 figs.

50888 (INIS-mf—10971, pp 298-307) **Computerized tomography of plasma in laboratory and space.** Preobrazhenskij, N.G. (AN SSSR, Novosibirsk. Inst. Teoreticheskoj i Prikladnoj Mekhaniki). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

Computerized tomography (CT) can be applied in plasma physics, however, some special problems, screening, diffraction, nonlinearities, poor temporal distribution limit the applicability and the accuracy of the CT results. The basic mathematical concepts of CT are formulated by terms of integral geometry. The related problems of plasma diagnostics are discussed from the simplest parameter-fitting of symmetric objects by rectilinear ray trajectories to the most complex problem of imaging asymmetric, inhomogeneous objects by distorted, refracted curvilinear ray trajectories. Some examples are given for the methods worked out in detail: the CT of arc discharges and plasma jets, the use of CT in tokamak and stellarator plasma diagnostics and in analysis of laser produced plasmas. Mathematically and physically related astrophysical problems (star clusters, solar corona) are noted as well. Development trends of the topic are surveyed. (D.Gy.). 67 refs.

50889 (INIS-mf—10971, pp 22-36) **Electron distribution function, transport and rate coefficients from higher order solution of Boltzmann's equation.** Winkler, R.; Wilhelm, J.; Braglia, G.L. (Zentralinstitut fuer Elektronenphysik, Greifswald, German Democratic Republic; Parma Univ., Italy. Ist. di Fisica). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

An improved method is presented for solving the plasma Boltzmann transport equation. The Boltzmann equation determines the electron velocity distribution function of plasmas. Earlier methods, mainly the conventional two-term approximation are inadequate in the practical cases. The new method uses the higher terms of the expansion by Legendre polynomials. The resulting singular differential-difference equation system is solved by direct numerical integration supported by an analysis of the mathematical structure of the general solution. The method is applied to model and real gas with isotropic scattering, to real gas with nonisotropic scattering, and to the inhomogeneous case. The future development of the method is discussed. (D.Gy.). 11 refs.; 16 figs.; 4 tables.

50890 (INIS-mf—10971, pp 37-51) **Transfer cross sections, transport collision frequencies and transport coefficients for elastic collisions.** Suchy, K. (Duesseldorf Univ., Germany, F.R. Inst. fuer Theoretische Physik). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

Grad's 13-moment approximation for the derivation of balance equations from the Boltzmann equation is generalized to multitemperature plasmas. The coefficients of the collision moments and the transport coefficients are expressed by suitably defined transport collision frequencies. 16 refs.

50891 (INIS-mf—10971, pp 333-344) **Non-Debye plasma theory.** Kakljugin, A.S.; Norman, G.E. (AN SSSR, Moscow. Inst. Radiotekhniki i Ehlektroniki). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

A review is given on the physical ideas of non-Debye plasma theory. An analytic expression for the correlation energy is discussed. The theory is applied to the calculations of thermodynamic properties. The results obtained are compared with the density expansion, the computer simulation and experiments. 15 refs.; 6 figs.

50892 (INIS-mf—10971, pp 1-21) **Magnetic reconnection in space and laboratory plasmas.** Bulanov, S.V.; Frank, A.G. (AN SSSR, Moscow. Fizicheskij Inst.). Mar 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87703562. (CONF-850718—).

From 17. international conference on phenomena in ionized gases; Budapest, Hungary (8 Jul 1985).

An important kind of plasma instabilities is the magnetic reconnection, when the topology of magnetic field lines changes suddenly, new field lines occur and reconnect. This phenomenon is often accompanied with fast variation of the magnetic field strength, burst-like acceleration of charged particles and fast plasma heating effects. The energy of magnetic field is transformed into heat and kinetic energy. The physical conditions of magnetic reconnection instability are investigated in detail. If the condition of freezing in of the magnetic field lines are not valid, the resistive diffusion of field lines can lead to the magnetic reconnection. The formation and explosive instability of current sheets are in close connection with magnetic reconnection processes. This phenomenon is important in laboratory, e.g. in fusion plasma experiments, and in the astrophysics, as the possible mechanism of solar flares. (D.Gy.). 64 refs.; 24 figs.; 2 tables.

50893 (IPPJ-REV—2, pp 120-132) **Relaxation phenomena in current-carrying toroidal plasmas.** Yoshida, Zensho. (Tokyo Univ., Japan. Faculty of Engineering). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

A theory of intrinsic dissipative structure is developed, which is to analyze the decay of a dissipative dynamical system. The theory is applied to the study of stable equilibria in magnetohydrodynamic (MHD) systems. Special sets of MHD equilibria are characterized as attractors of MHD systems, and they are shown to be classified into four classes, which cover wide range of experimentally observed MHD equilibria.

50894 (IPPJ-REV—2, pp 133-147) **Self-organization process in three-dimensional magnetohydrodynamics.** Horiuchi, Ritoku. (Hiroshima Univ., Japan. Inst. for Fusion Theory). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

A self-organization process of a dissipative magnetohydrodynamic plasma confined in a coducting vessel is investigated in detail by means of a variational method and a magnetohydrodynamic simulation. Several simulation runs are carried out for both compressible and incompressible media. The self-organized state for a incompressible case is given by a minimum magnetic energy condition with the constraint that the total magnetic helicity is constant, while, for an incompressible case, the system self-organizes to a maximum entropy state under the same constraint as the incompressible case. For each case magnetic reconnection is triggered at local minimum points of the magnetic helicity density where the selective dissipation of magnetic energy effectively takes place owing to the generation of nonhelical magnetic energy modes ("magnetic bubbles"). It is also observed that the magnetic energy spectrum cascades toward the high wavenumber region in a relaxation phase while the helicity spectrum inversely cascades toward the low wavenumber region.

50895 (IPPJ-REV—2, pp 176-187) **Ripple enhanced transport of suprathermal alpha particles.** Tani, K.; Takizuka, T.; Azumi, M. (Japan Atomic Energy Research Inst., Naka, Ibaraki. Naka Fusion Research Establishment). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

The ripple enhanced transport of suprathermal alpha particles has been studied by the newly developed Monte-Carlo code in which the motion of banana orbit in a toroidal field ripple is described by a mapping method. The existence of ripple-resonance diffusion has been confirmed numerically. We have developed another new code in which the radial displacement of banana orbit is given by the diffusion coefficients from the mapping code or the orbit following Monte-Carlo code. The ripple loss of α particles during slowing down has been estimated by the mapping model code as well as the diffusion model code. From the comparison of the results with those from the orbit-following Monte-Carlo code, it has been found that all of them agree very well.

50896 (IPPJ-REV—2, pp 28-51) **Class renormalization: islands around islands.** Meiss, J.D. (Texas Univ., Austin, USA. Inst. for Fusion Studies). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

An orbit of 'class' is one that rotates about a periodic orbit of one lower class with definite frequency. This contrasts to the 'level' of a periodic orbit which is the number of elements in its continued fraction expansion. Level renormalization is conventionally used to study the structure of quasi-periodic orbits. The scaling structure of periodic orbits encircling other periodic orbits in area preserving maps is discussed here. Fixed points corresponding to the accumulation of p/q bifurcations are found and scaling exponents determined. Fixed points for $q > 2$ correspond to self-similar islands around islands. Frequencies of the island boundary circles at the fixed points are obtained. Importance of this scaling for the motion of particles in stochastic regions is emphasized.

50897 (IPPJ-REV—2, pp 62-70) **F/sup -ν/ spectrum and stagnant motions in phase space.** Aizawa, Yoji. (Waseda Univ., Tokyo, Japan. School of Science and Engineering). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Naive mechanisms which create the f/sup -ν/ spectrum are discussed and some numerical simulations for the intermittency, fat fractals and homoclinic chaos are briefly reviewed.

50898 (IPPJ-REV—2, pp 71-104) **Global spectral structures of intermittent chaos.** Mori, Hazime; Okamoto, Hisao; So, Byon-Chol; Kuroki, Shoichi. (Kyushu Univ., Fukuoka, Japan. Dept. of Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Power spectra of intermittent chaos near its onset point is formulated in order to clarify fluctuations of periodic laminar motions caused by turbulent bursts. It is shown that the power spectra exhibit eminent peaks at selected frequencies mω/sub 0/ with m = 0,1,2, ... and an eigenfrequency ω/sub 0/ of the laminar motions. The peak at zero frequency is produced by fluctuations of durations of the laminar motions, whereas the peaks at nonzero frequencies are generated by jumps of phase shifts of the laminar motions by bursts. The shape of each peak turns out to obey an inverse-power law 1/chemical bondω-mω/sub 0/chemical bond/sup zeta(sub m/ with a universal exponent zeta/sub m/. For the type I intermittency caused by the saddle-node bifurcation, zeta/sub 0/ = 1, zeta/sub 1/ = 2 under normal reinjections, whereas zeta/sub 0/ = zeta/sub m/ = 1 if reinjections are restricted to the upper half of a narrow channel of the tangent map. For the type III intermittency caused by the inverted period-doubling bifurcation, zeta/sub m/ = 3/2 for $m \geq 1$.

50899 (IPPJ-REV—2, pp 105-119) **Coherent anomaly and asymptotic method in cooperative phenomena.** Suzuki, Masuo. (Tokyo Univ., Japan. Dept. of Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

A new general method is proposed to study asymptotic behaviors of cooperative systems. This is based on the appearance of "coherent anomaly" in mean-field-type approximations of cooperative systems. This is powerful in evaluating non-classical scaling exponents of cooperative phenomena.

50900 (IPPJ-REV—2, pp 148-158) **On the forces and fluxes in non-equilibrium thermodynamics.** Kitahara, Kazuo. (Tokyo Inst. of Tech., Japan). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

A formulation of non-equilibrium thermodynamics of continuum systems based on local equilibrium assumption is reported. Thermodynamic forces are defined from a generalized local entropy and irreversible fluxes are defined as non-advective parts of fluxes of conservative quantities. The validity of the general evolution criterion and its generalization is discussed.

50901 (IPPJ-REV—2, pp 188-211) **Stochastic diffusion in the standard map.** Ichikawa, Y.H.; Kamimura, T.; Hatori, T. (Nagoya Univ., Japan. Inst. of Plasma Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Numerical observation of stochastic diffusion in the standard map has been carried out in the domain of small stochastic parameter A/sub c/ < A < 1.0, where A/sub c/ is given as (2)/sup -1/ 0.9716 = 0.1546. Multiple periodic accelerator modes manifest their pronounced sharp resonant effect in the stochastic diffusion process even in the region of small stochastic parameter, where the fundamental accelerator modes is not allowed to exists.

50902 (IPPJ-REV—2, pp 212-225) **Spatiotemporal complexity in coupled map lattices.** Kaneko, Kunihiko. (Tokyo Univ., Japan. Coll. of General Education). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Some spatiotemporal patterns of couple map lattices are presented. The chaotic kink-like motions are shown for the phase motion of the coupled circle lattices. An extension of the couple map lattice approach to Hamiltonian dynamics is briefly reported. An attempt to characterize the high-dimensional attractor by the extension of the correlation dimension is discussed.

50903 (IPPJ-REV—2, pp 265-279) **Transport toward thermal equilibrium in a pure electron plasma.** Dubin, D.H.E.; O'Neil, T.M.; Driscoll, C.F. (California Univ., San Diego, La Jolla, USA). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

A new theory of cross-magnetic field transport due to like-particle collisions is presented. The new theory supercedes the traditional theory in the parameter regime where the Debye length is large compared to the Larmor radius (λ/sub D/ >> r/sub L/); the flux predicted by the new theory exceeds that predicted by the traditional theory by a factor of O(λ/sub D//sup 2//r/sub L//sup 2/) >> 1. Furthermore, transport due to lightly damped waves can enhance the flux in certain cases. The elementary step in the new transport process is due to the E x B drift of a particle guiding center which occurs during a binary collision. Previous discussions of like-particle transport considered only the regime r/sub L/ >> λ/sub D/; in this case the step in the guiding center position is due to collisional scattering of the velocity vector. The regime r/sub L/ << λ/sub D/ is standard for magnetically confined pure electron plasmas. Experiments are discussed in which transport toward thermal equilibrium is measured in such plasmas. The measured flux agrees with the new theory rather than the traditional theory.

50904 (IPPJ-REV—2, pp 280-288) **Statistical physics of dense plasmas. Generalized viscoelastic theory of the glass transition.** Ichimaru, Setsuo; Tanaka, Shigenori. (Tokyo Univ., Japan. Dept. of Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

We present a new statistical theory of dynamic correlations for a classical one-component plasma (OCP) in strong Coulomb coupling within the generalized viscoelastic formalism. The dynamic structure factor and the coefficient of shear viscosity for the OCP in a metastable supercooled state are investigated and the possibility of a glass transition is predicted. Relevance to laboratory experiment is pointed out through analyses of the metastable-state lifetimes against homogeneous nucleation of the crystalline state.

50905 (IPPJ-REV—2, pp 289-303) **Properties of strongly-coupled plasma in supercooled metastable state and ion plasma in penning trap. Numerical experiments.** Totsuji, Hiroo. (Okayama Univ., Japan. School of Engineering). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Numerical experiments on the classical one-component plasma (OCP) are extended to the domain where OCP is in the supercooled liquid state beyond the first order liquid-solid transition. The supercooled metastable liquid is obtained by rapidly quenching the ordinary liquid and static and dynamic properties are analysed. As a possibility of realizing strongly-coupled OCP in laboratories, the behavior of low temperature ions in the Penning trap is simulated and strong coupling effects are observed.

50906 (IPPJ-REV—2, pp 345-355) **Simulation of diffusion in concentrated lattice gases.** Kehr, K.W. (Tokyo Inst. of Tech., Japan). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Recently the diffusion of particles in lattice gases was studied extensively by theoretical methods and numerical simulations. This paper reviews work on collective and, in particular, on tracer diffusion. The diffusion of tagged particles is characterized by a correlation factor whose behavior as a function of concentration is now well understood. Also the detailed kinetics of the tracer transitions was investigated. A special case is the one-dimensional lattice gas where the tracer diffusion coefficient vanishes. An interesting extension is the case of tagged atoms with a different transition rate. This model allows to study various physical situations, including impurity diffusion, percolation, and diffusion in partially blocked lattices. Finally some recent work on diffusion in lattice gases under the influence of a drift field will be reported.

50907 (IPPJ-REV—2, pp 252-264) **Nonlinear saturation of MHD ballooning modes.** Tuda, Takashi. (Japan Atomic Energy Research Inst., Naka, Ibaraki. Naka Fusion Research Establishment). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

We study the saturation mechanism of ballooning mode by using a system of two-fluids equation with Maxwell equations in two dimensional geometry. At the beta value below the critical one derived from MHD analysis, electrostatic ballooning modes are unstable and high-m (m; poloidal mode number) eddies are formed. With increasing beta value, longer wave-length modes are realized. Above the critical beta value, m = 1 or m = 2 modes dominate other modes and magnetic fluctuation is enhanced.

50908 (IPPJ-REV—2, pp 8-13) **Wave packets and WKB theory in phase space.** Littlejohn, R.G. (California Univ., Berkeley, USA. Dept. of Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

A practical difficulty of traditional WKB theory is that it suffers from non-physical infinities at caustics. A theoretical difficulty is that it does not possess any reasonable covariance or invariance properties under transformations in phase space. It turns out that the solution of one of these problems also solves the other, and leads to a version of WKB theory in phase space. The new theory is most easily implemented by using wave packets.

50909 (IPPJ-REV—2, pp 14-27) **Nonlinear collisional drift waves and ion-acoustic waves propagating in a magnetic field with shear.** Taniuti, Tosiya. (Nagoya Univ., Japan. Dept. of Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

A collisional drift wave localized about a mode rational surface is discussed in a slab model by means of a model equation for the electrostatic potential comprising the usual nonlinear term due to the polarization drift and a collisional effect enhanced by a magnetic shear. Also an ion-acoustic wave propagating in the poloidal direction with the toroidal symmetry is studied to examine a possibility that solitons with scale of the effective ion-Larmor radius are formed. A KdV equation is derived for a plasma rotating with a speed nearly equal to the wave velocity.

50910 (IPPJ-REV—2, pp 52-61) **Long-time correlation in the two-wave Hamiltonian.** Irie, H.; Hatori, T. (Nihon Univ., Tokyo. Dept. of Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

The time-correlation function of velocity is found to decay with the power law for the orbit governed by a Hamiltonian, H = (1/2)V/sup 2/-Mcosx-Pcos [K(x-t)]. The renormalization group technique can predict the power of decay for the correlation function. The power spectrum becomes the 1/f-type for a special case.

50911 (IPPJ-REV—2, pp 159-175) **Transport in drift waves.** Horton, W. (Texas Univ., Austin, USA. Inst. for Fusion Studies). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

The conditions for the onset of stochasticity and the nature of the ensuing transport are investigated for particle motion in two drift waves.

50912 (IPPJ-REV—2, pp 226-240) **Remarks on the clump theory.** Krommes, J.A. (Princeton Univ., NJ, USA. Plasma Physics Lab.). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Further details are provided of a recently published dialog [Phys. Fluids 29 (July, 1986)] which discussed the role of the small scales in fluid clump theory. It is argued that the approximation of the clump lifetime which is compatible with exponentially rapid separation of adjacent orbits is inappropriate for the description of the dynamically important large scales. Various other remarks are made relating to the analytic treatment of strong drift-wave-like turbulence.

50913 (IPPJ-REV—2, pp 241-251) **Resistive drift wave turbulence and transport.** Wakatani, M. (Kyoto Univ., Uji, Japan. Plasma Physics Lab.). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

Our efforts for studying the properties of resistive drift wave turbulence by using model mode-coupling equations are shown. It may be related to the edge turbulence and the associated anomalous transport in tokamaks or in stellarator/heliotron.

50914 (IPPJ-REV—2, pp 319-344) **Resonant ion acceleration by magnetosonic shock waves.** Ohsawa, Yukiharu. (Nagoya Univ., Japan. Inst. of Plasma Physics). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

It is shown by theory and a relativistic, electromagnetic particle simulation that strong ion acceleration occurs in a fast magnetosonic shock wave; the maximum speed of trapped ions can be about (m/sub i//m/sub e/)/sup 1/2/ times as large as the Alfven speed in a quasiperpendicular shock. The acceleration takes place even in laminar shock waves. The magnitude of the acceleration increases with ω/sub ce//ω/sub pe/ and is enhanced by finite beta effects. For a parameter regime ω/sub ce//ω/sub pe/ > approx 1, highly relativistic ions and electrons are produced simultaneously in the shock ramp. The structure of a nonlinear slow wave and associated resonant ion acceleration is also discussed.

50915 (JAERI-M—86-194) **Beat frequency stabilization between two HCN lasers by phase locked loop.** Uesugi, Yoshihiko; Matoba, Tohru; Mizuno, Koji. (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703615.

The frequency stabilization circuit using a phase locked loop (PLL) was developed to stabilize a beat frequency of HCN laser interferometer in the JFT-2M tokamak. The application of this frequency stabilization circuit is to observe waves and density fluctuations in plasmas by laser scattering measurement. The frequency resolution of PLL is less than 10 kHz. The lock range obtained experimentally is about 1 MHz and its value is high enough to stabilize the beat frequency between two HCN lasers. The present PLL circuit can be applied to the scattering experiment in JFT-2M.

50916 (JAERI-M—87-004) **Kink instability of the divertor configuration in JT-60.** Ozeki, Takahisa; Seki, Shogo; Ninomiya, Hiromasa; Azumi, Masafumi. (Japan Atomic Energy Research Inst., Tokyo). Feb 1987. 24p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703621.

The large tokamak device JT-60 has a poloidal divertor with a stagnation point in the outerside of torus. The divertor configuration has a large shear near the plasma surface by the effect of X-point. Therefore kink modes are expected to be stabilized by this shear. In this report, characteristics of n = 1 free boundary kink instability for the divertor configuration plasma are numerically analyzed by using the ideal MHD stability code ERATO-J. The following results were obtained; 1) The kink instability displacements in divertor configuration are localized near the plasma surface and the growth rate is reduced by the shear. 2) The stability window in a divertor configuration with low β (β/sub p/ < approx. 0.5) is wider than that in a limiter configuration, but the difference becomes small as the beta increases (β/sub p/ > approx. 1.0). 3) In high β, the growth rate in a divertor configuration is smaller than that in a limiter configuration, but the divertor configuration plasma has the almost same critical beta value as the limiter configuration plasma has.

50917 (JAERI-M—87-008) **Energy confinement and profile characteristics during the initial neutral beam heating in JT-60.** Kikuchi, Mitsuru; Hirayama, Toshio; Shimizu, Katsuhiro. (Japan Atomic Energy Research Inst., Tokyo). Feb 1987. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703623.

Confinement results are reported during the 3 months initial operation of JT-60 tokamak with I/sub p/ of 1 - 2 MA, n-bar/sub e/ of 1.5 - 7 x 10/sup 19/ m/sup -3/ and P/sub abs/ up to 20 MW. The plasma stored energy follows an offset linear relation with the absorbed power and the incremental energy confinement time tau/sub E//sup inc/ (= dW/sub s//dP/sub abs/) for thermal components is almost independent of I/sub p/ and n-bar/sub e/ and is 60 msec. A remarkable difference in the density profile has been observed between limiter and divertor discharges. The electron temperature profile shape is rather tight compared with the density profile although broader profiles have been observed in high density beam heated discharges.

50918 (JAERI-M—87-011) **Soft x-ray measurements of the JT-60 tokamak plasma in the initial experiments.** Nishitani, Takeo; Nagashima, Keisuke; Takeuchi, Hiroshi. (Japan Atomic Energy Research Inst., Tokyo). Feb 1987. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703624.

The X-ray pulse height analysis in the energy range of 3 - 60 keV was performed for JT-60 ohmically heated and initial neutral beam heated plasma, using a liquid-nitrogen cooled high purity germanium detector. The time evolution of the electron temperature was derived from the measured spectra with the time resolution of 100 ms. The electron temperature was obtained up to 3.0 keV in the typical divertor ohmically heated discharges with plasma current 2 MA. The dominant metal impurity is titanium. The typical impurity density and the effective ionic charge Z/sub eff/ were estimated from these measurements, and the titanium density of 10/sup -3/ % and Z/sub eff/ of 1.2 were could be obtained for the typical ohmically heated divertor discharges. And the titanium densities of neutral beam heating discharges are about factor 2 larger than ones of ohmically heating.

50919 **(JAERI-M—87-014) Numerical analysis of sawtooth oscillations in Joule heating plasma in JT-60.** Shirai, Hiroshi; Nagashima, Keisuke; Nishitani, Takeo. (Japan Atomic Energy Research Inst., Tokyo). Feb 1987. 34p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87703625.

Characteristics of sawtooth oscillations in soft X ray intensity emitted from JT-60 plasma in Joule heating phase have been numerically studied by using 1-D Tokamak transport code with the model of helical magnetic flux exchange by m = 1/n = 1 multitearing mode. As the plasma current increases, inversion radius of soft X ray intensity and period of sawtooth oscillations increase, and double sawtooth oscillations occur among single sawtooth oscillations. Occurrence of double sawtooth oscillations is closely related to resistive skin time tau/sub R/. (= μ/sub 0/r/sub 1//sup 2//eta, where r/sub 1/ is inversion radius of soft X ray intensity and eta is plasma resistivity) If tau/sub R/ becomes larger than critical value tau/sub R//sup c/, double sawtooth oscillations occur. Results of numerical calculation show that tau/sub R//sup c/ is about 3.0 second, which is in good agreement with the value obtained in experiments.

50920 **(LA-UR—87-2803) Numerical modeling of slow shocks.** Winske, D. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 21p. (CONF-8708141—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014768.

From 6. meeting of solar wind; Estes Park, CO, USA (24 Aug 1987).

This paper reviews previous attempt and the present status of efforts to understand the structure of slow shocks by means of time dependent numerical calculations. Studies carried out using MHD or hybrid-kinetic codes have demonstrated qualitative agreement with theory. A number of unresolved issues related to hybrid simulations of the internal shock structure are discussed in some detail. 43 refs., 8 figs.

50921 **(LBL—22750) Accelerator and Fusion Research Division: Summary of activities, 1986.** (Lawrence Berkeley Lab., CA (USA)). 15 Apr 1987. Contract AC03-76SF00098. 97p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87013955.

This report contains a summary of activities at the Lawrence Berkeley Laboratory's Accelerator and Fusion Research Division for the year 1986. Topics and facilities investigated in individual papers are: 1-2 GeV Synchrotron Radiation Source, the Center for X-Ray Optics, Accelerator Operations, High-Energy Physics Technology, Heavy-Ion Fusion Accelerator Research and Magnetic Fusion Energy. Six individual papers have been indexed separately. (LSP)

50922 **(ORNL—6335) Implementation of a 3-D nonlinear MHD calculation on the Intel hypercube.** Drake, J.B.; Lawkins, W.F.; Carreras, B.A.; Hicks, H.R. (Oak Ridge National Lab., TN (USA)). Aug 1987. Contract AC05-84OR21400. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014637.

As part of an exploratory study of the suitability of hypercube multiprocessors for scientific computations, the non-linear magnetohydrodynamics (MHD) code RSF was parallelized for use on an Intel iPSC hypercube. This report presents the numerical algorithm of RSF and the techniques used to obtain parallelism without sacrificing the numerical properties of the serial algorithm. Timing results are presented for a sample problem.

50923 **(PPPL—2455) Reduction in TFTR [Tokamak Fusion Test Reactor] fusion reaction rate by unbalanced beam injection and rotation.** Hendel, H.W.; Jassby, D.L.; Bitter, M.L.; Taylor, G. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jun 1987. Contract AC02-76CH03073. 10p. (CONF-870629—10). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000119.

From 14. European conference on controlled fusion and plasma physics; Madrid, Spain (22 Jun 1987).

In TFTR plasmas at low to moderate density, the highest fusion energy gain Q/sub dd/ (D-D fusion power/injected power P/sub b/) is obtained with nearly balanced co- and counter-injection of neutral beams. For a given beam power, significantly unbalanced injection reduces Q/sub dd/ because the accompanying plasma rotation reduces the beam-target fusion reactivity, the fast-ion slowing-down time, and the beam-beam reaction rate, while <T/sub e/> and <T/sub i/> decrease from their maximum values. 9 refs., 3 figs., 1 tab.

50924 **(UCB/ERL-M—87/52) The Pierce diode with an external circuit: II, Non-uniform equilibria.** Lawson, W.S. (California Univ., Berkeley (USA). Electronics Research Lab.). 22 Jul 1987. Contract FG03-86ER53220. 45p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000415.

The non-uniform (non-linear) equilibria of the classical (short circuit) Pierce diode and the extended (series RLC external circuit) Pierce diode are described theoretically, and explored via computer simulation. It is found that most equilibria are correctly predicted by theory, but that the continuous set of equilibria of the classical Pierce diode at $\alpha = 2\pi$ are not observed. The stability characteristics of the non-uniform equilibria are also worked out, and are consistent with the simulations. 8 refs., 22 figs., 3 tabs.

50925 **(UCRL—96665) Axial power loss along open field lines.** Correll, D.L. (Lawrence Livermore National Lab., CA (USA)). 1 Aug 1987. Contract W-7405-ENG-48. 12p. (CONF-870908—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000224.

From Course and workshop on physics of mirrors, reversed field pinches and compact tori; Varenna, Italy (1 Sep 1987).

Studies are underway to evaluate the linear mirror geometry as a candidate for a high-fluence, neutron irradiation facility. This steady-state, low-Q design is currently perceived to comprise a two-component plasma driven by neutral beams with mirror confinement of the hot ions and with no electrostatic axial reduction in the warm ion end losses. Warm-ion fueling and end-wall power density will require substantial cold plasma exterior to the mirror cell and neutral gas near the end wall. In this paper, we evaluate to what extent the loss power parallel to the axial magnetic field along open field lines is a function of the escaping plasma and end-wall parameters. By allowing the source power to depend directly on the plasma density and electron temperature, several new conclusions may be pertinent to closed field-line geometries with open field-line divertors.

50926 **(UCRL—96672) Mirror theory applied to toroidal systems.** Cohen, R.H. (Lawrence Livermore National Lab., CA (USA)). 25 Aug 1987. Contract W-7405-ENG-48. 18p. (CONF-870908—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000217.

From Course and workshop on physics of mirrors, reversed field pinches and compact tori; Varenna, Italy (1 Sep 1987).

Central features of a mirror plasma are strong departures from Maxwellian distribution functions, ambipolar potentials and densities which vary along a field line, end losses, and the mirror field itself. To examine these features, mirror theorists have developed analytical and numerical techniques to solve the Fokker-Planck equation, evaluate the potentials consistent with the resulting distribution functions, and assess the microstability of these distributions. Various combinations of mirror-plasma features are present and important in toroidal plasmas as well, particularly in the edge region and in plasmas with strong rf heating. In this paper we survey problems in toroidal plasmas where mirror theory and computational techniques are applicable, and discuss in more detail three specific examples: calculation of the toroidal generalization of the Spitzer-Haerm distribution function (from which trapped-particle effects on current drive can be calculated), evaluation of the nonuniform potential and density set up by pulsed electron-cyclotron heating, and calculation of steady-state distribution functions in the presence of strong rf heating and collisions. 37 refs.

50927 **Differential form of the collision integral for a relativistic plasma.** Braams, B.J.; Karney, C.F.F. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). *Physical Review Letters;* **59**: No. 16, 1817-1820(19 Oct 1987).

The differential formulaton of the Landau-Fokker-Planck collision integral is developed for the case of relativistic electromagnetic interactions.

50928 **Multichannel far-infrared laser interferometer for electron density measurements on the tokamak fusion test reactor.** Mansfield, D.K.; Park, H.K.; Johnson, L.C.; Anderson, H.M.; Chouinard, R.; Foote, V.S.; Ma, C.H.; Clifton, B.J. (Princeton University, Plasma Physics Laboratory, Princeton, New Jersey 08544). *Applied Optics;* **26**: No. 20, 4469-4474(15 Oct 1987).

A ten-channel far-infrared laser interferometer which is routinely used to measure the spatial and temporal behavior of the electron density profile on the tokamak fusion test reactor is described, and representative results are presented. This system has been designed for remote operation in the very hostile environment of a fusion reactor. The possible expansion of the system to include polarimetric measurements is briefly outlined.

50929 **Steady-state inductive spheromak operation.** Janos, A.C.; Jardin, S.C.; Yamada, M. (to Dept. of Energy, Washington, DC). US Patent 4,687,617. 18 Aug 1987. Filed date 20 Feb 1985. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A steady-state method is described of maintaining an inductively formed spheromak plasma comprising the steps of: (a) inductively producing a spheromak plasma by: evacuating a vacuum vessel and filling the vessel with a neutral species; producing a first poloidal magnetic field within the vacuum vessel; producing a second poloidal magnetic field within the vacuum vessel by pulsing a current I/sub pf/ in a first direction through a poloidal field generating coil, the poloidal field generating coil being located in a toroidally shaped flux core within the vacuum vessel, such that the first and second poloidal magnetic fields are superimposed to form a composite poloidal magnetic field PSI within the vacuum vessel having regions of stronger and weaker strength; producing a toroidal magnetic field PHI in the vacuum vessel by passing a current I/sub TF/ through a toroidal field generating coil which is located in the flux core, thereby initiating a plasma discharge and causing toroidal flux to appear outside of the flux core; expanding the plasma in the direction of the region of weaker poloidal magnetic field strength; (b) forming a linked toroidal spheromak plasma from the expanded plasma in which some flux surfaces of the spheromak plasma and the core; and (c) oscillating the poloidal and toroidal magnetic fields PSI and PHI, while the plasma flux surfaces are linked to both the plasma and the core, such that PSI and PHI have different phases.

50930 **Implosion experiments at Nova.** Cable, M.D. (Lawrence Livermore National Lab., P.O. Box 5508, Livermore, CA 94550). pp 38 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Recent experiments at Nova focused on achieving and diagnosing high-density implosions. Primary diagnostics are based on neutron measurements and include dt and dd neutron yields through Cu, Ag, and In activation, fuel ion temperature through neutron time of flight, pusher areal density through Si activation, and fuel areal density through measurements of secondary dt neutrons from pure deuterium fuel. This last technique is of particular interest for high-density implosions since it provides direct measurement of fuel <rhoR>; however, this diagnostic is complicated for <rhoR> values so large that the secondary tritons lose significant energy in the fuel. Techniques for making large fuel <rhoR> measurements with secondary dt neutrons are discussed. Experimental implosion results and interpretations are presented. In addition to the high-density experiments, high thermonuclear yield experiments are also performed and results are presented.

7002 Fusion Power Plant Technology

REFER ALSO TO CITATION(S) 49962, 50053, 50054, 50921, 50930, 51012

50931 **(CNIC—00024) Conceptual design study for a mirror fusion breeder.** Huang Jinhua; Deng Boquan; Li Guiqing. (China Nuclear Information Centre, Beijing, BJ). 1986. 11p. (In Chinese). (SIP—0003). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703391.

A mirror fusion breeder, CHD, has been designed for providing plenty of nuclear fuel for light water reactors to meet the needs for rapid development of nuclear power in the first half of next century. The breeder is able to support the nuclear fuel needs for more than 10 LWRs of equal scale in power with fuel enriched directly in CHD without reprocessing. Measures are taken to flatten the power density distribution in the blanket so that fission is suppressed in the region close to the plasma, and by this way fuel production is enhanced for this direct enriched fusion breeder. In order to reduce the MHD pressure drop, LiPb flows in the blanket axially. Though the tritium inventory in the reactor is very low, special material and design have to be developed to reduce the permeation of tritium through the coolant pipes. The cost of electricity from the system, consisting of 11 LWR plants and one fusion breeder is predicted to be 1.05 times of that from a traditional LWR plant. This figure is insensitive both to the cost of CHD and its support ratio.

50932 **(CNIC—00030) Engineering test operation of HL-1 Tokamak.** Jiao Boliang; Yan Jiancheng; Li Xiaodong; Li Jiamin Tan Manqiu; Li Lijuan; Qiu Yuxuan; Fu Shucai. (China Nuclear Information Centre, Beijing, BJ). 1986. 11p. (In Chinese). (SIP—0009). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703397.

Some of the main technicai issues of engineering tests and plasma discharging of HL-1 Tokamak are described. The experimental results of magnetic field configuration and volt-second intake are given in detail. The operating regimes and performances are described. The machine has been operated at toroidal magnetic field up to 2.3 T with plasma current of 135 kA. The test operations show that HL-1 Tokamak has good technical performances, and meet the demands of physics experiments basically.

50933 **(CNIC—00031) Development of the 80 MVA A.C. pulse generator unit.** Miao Jiaqi; Gao Yunxia; Quan Jinguan; Yu Zhenran; Xu Shizhang; Wan Gen. (China Nuclear Information Centre, Beijing, BJ). 1986. 11p. (In Chinese). (SIP—0010). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703398.

The general idea of the development of the 80 MVA A.C. pulse generator unit is described. During the developing, the techniques and methods for solving six special problems are analysed, they are the scheme of the electromagnetic design, the identification of the temperature increase caused by the rotor surface harmonic heating, the special structure of the stator winding and the rotor damper winding, analysies and tests of the six-phase generator under the sudden outside short-circuit, the structure of the shaft system and its vibration and torsion. Combine with the main experimental parameters and several year's operation experience an overall assessment is given.

50934 **(CONF-871036—2) Defect microstructures in neutron-irradiated copper and stainless steel.** Zinkle, S.J.; Sindelar, R.L. (Oak Ridge National Lab., TN (USA); Savannah River Lab., Aiken, SC (USA)). Sep 1987. Contract AC05-84OR21400. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000337.

From 3. international conference on fusion reactor materials; Karlsruhe, F.R. Germany (4 Oct 1987).

The defect microstructures of copper and type 304L austenitic stainless steel have been examined following neutron irradiation under widely different conditions. Less than 0.2% of the defect clusters in steel irradiated at 120°C with moderated fission neutrons were resolvable as stacking fault tetrahedra (SFT). The fraction of defect clusters identified as SFT in copper varied from ~10% for a low-dose 14-MeV neutron irradiation at 25°C to ~50% for copper

irradiated to 1.3 dpa in a moderated fission spectrum at 182°C. The mean cluster size in copper was about 2.6 nm for both cases, despite the large differences in irradiation conditions. The mean defect cluster size in the irradiated steel was about 1.8 nm. The absence of SFT in stainless steel may be due to the generation of 35 appm He during the irradiation, which caused the vacancies to form helium-filled cavities instead of SFT. 20 refs.

50935 **(CONF-871036—3) Impact behavior of 9-Cr and 12-Cr ferritic steels after low-temperature irradiation.** Klueh, R.L.; Vitek, J.M.; Corwin, W.R.; Alexander, D.J. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000333.

From 3. international conference on fusion reactor materials; Karlsruhe, F.R. Germany (4 Oct 1987).

Miniature Charpy impact specimens of 9Cr-1MoVNb and 12Cr-1MoVW steels and these steels with 1 and 2% Ni were irradiated in the High-Flux Isotope Reactor (HFIR) at 50°C to displacement damage levels of up to 9 dpa. Nickel was added to study the effect of transmutation helium. Irradiation caused an increase in the ductile-brittle transition temperature (DBTT). The 9Cr-1MoVNb steels, with and without nickel, showed a larger shift than the 12Cr-1MoVW steels, with and without nickel. The results indicated that helium also increased the DBTT. The same steels were previously irradiated at higher temperatures. From the present and past tests, the effect of irradiation temperature on the DBTT behavior can be evaluated. For the 9Cr-1MoVNb steel, there is a continuous decrease in the magnitude of the DBTT increase up to an irradiation temperature of about 400°C, after which the shift drops rapidly to zero at about 450°C. The DBTT of the 12Cr-1MoVW steel shows a maximum increase at an irradiation temperature of about 400°C and less of an increase at either higher or lower irradiation temperatures.

50936 **(CONF-871036—4) Reduced-activation ferritic steels: A comparison with Cr-Mo steels.** Klueh, R.L.; Maziasz, P.J. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000332.

From 3. international conference on fusion reactor materials; Karlsruhe, F.R. Germany (4 Oct 1987).

"Reduced-activation" ferritic steels are being developed to replace the Cr-Mo steels presently being considered for fusion-reactor applications. To meet the reduced-activation criteria, the steels cannot contain Mo, Nb, Ni, Cu, and N. Tungsten is proposed as a substitute for molybdenum and niobium is replaced by tantalum and an increased use of vanadium. An initial series of Cr-W steels have been produced that are analogous to the Cr-Mo steels. Microstructural examination, tempering studies, tensile tests, and Charpy impact tests indicate that three Cr-W steels with 9 to 12% Cr are comparable to the 9Cr-1MoVNb and 12Cr-1MoVW steels, which are presently the primary candidate ferritic steels for fusion applications.

50937 **(CONF-871101—58) Effect of helium on irradiation creep in an austenitic stainless steel.** Grossbeck, M.L.; Horak, J.A. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013754.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The first wall of a fusion reactor will be subjected to a flux of high energy neutrons which will result in the formation of atomic displacements and their associated phenomena, coupled with the formation of helium via (n,α) reactions. The purpose of the experiments described here is to determine the irradiation creep properties of several austenitic stainless steels under irradiation conditions that simulate fusion reactor conditions in terms of both damage rate and helium generation rate (He:dpa ratio).

50938 **(CONF-8707106—2) Comparative analysis of INTOR-like designs: Status and preliminary results.** Flanagan, C.A.; Galambos, J.D.; Peng, P.K.M.; Reid, R.L.; Strickler, D.J. (Oak Ridge National Lab., TN (USA)). Jul 1987. Contract AC05-84OR21400. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87014064.

From INTOR workshop; Vienna, Austria (13 Jul 1987).

This document provides an interim status report on the INTOR tasks related to the critical analysis of INTOR-like designs. At the INTOR Workshop in December 1986, and updated at the INTOR related Specialists' Meeting in March 1987, a series of comparative analysis studies was established. Initial results were targeted for completion for the July INTOR meeting and final results completed for the November INTOR meeting. The goal of the analytic comparisons is to evaluate and determine the specific impact of how different choices affect the design. The results of such an analytic determination should allow the international community to identify and agree upon which aspects of choice have what influence on the International Thermonuclear Experimental Reactor (ITER) design.

50939 **(CONF-8708138—1-Vugraphs) HFIR [High-Flux Isotope Reactor] irradiation facilities and design of spectral-tailored fusion reactor materials irradiation experiments.** Thoms, K.R. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014570.

From U.S./USSR fusion materials workshop; Oak Ridge, TN, USA (31 Aug 1987).

The Oak Ridge High-Flux Isotope reactor is a pressurized, light-water-cooled, beryllium-reflected, 100 mw research reactor. It was specifically designed and built for the production of transuranium isotopes. It has the highest continuous flux of thermal neutrons in the world and is used for neutron beam scattering experiments and engineering materials, irradiations. This paper discusses the facility and experiment planning for irradiation of fusion reactor materials. (FI)

50940 **(EUR-CEA-FC—1276-Vol.1) Tore Supra: technical description.** (Association Euratom-CEA, Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee). Aug 1986. 271p. (In French). NTIS (US Sales Only), PC A12/MF A01. File Number DE87752817.

This report is aimed, after a brief recall of physics and technologic perspectives of Tore Supra, at giving a detailed description of the basic machine; details of each component are defined. Volume 1 is specifically concerned with the general aspects of Tore Supra and the toroidal field system.

50941 **(EUR-CEA-FC—1276-Vol.2) Tore Supra: technical description.** (Association Euratom-CEA, Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee). Aug 1986. 278p. (In French). NTIS (US Sales Only), PC A13/MF A01. File Number DE87752818.

This report volume is devoted to system composed of vacuum vessel and thermal shields, and to poloidal field system. Mocks realized to study feasibility and structure properties are presented, mechanical calculations (with different cases of static and dynamic loads for vacuum vessel) are resumed, first wall components are described. Techniques designed to dissipate plasma power, to control recycling and maintain a good impuritiy rate are examined. Principal fabrication process are described together with pumping systems; and control of pumping circuits. For poloidal field, electrical power supplies, operation and use priciples, field coils and magnetic circuits are described.

50942 **(EUR-CEA-FC—1276-Vol.3) Tore Supra: technical description.** (Association Euratom-CEA, Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee). Aug 1985. 209p. (In French). NTIS (US Sales Only), PC A10/MF A01. File Number DE87752804.

Cryogenic system of Tore Supra is described with its principal functions and operation modes. Data control and acquisition with on line data processing is presented. Radiation dose and induced radioactivity evaluation is studied. Cooling system is detailed together with characteristics of facilities and circuits to cool. Then machine assembly and buildings are presented.

50943 (IAEA-TECDOC—417, pp 33-40) **Survey of the insulation problems of the magnets for NET.** Poehlchen, R. (Max-Planck-Institut fuer Plasmaphysik, Garching, Germany, F.R.). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

The insulation problems of the magnets for NET including requirements for the insulation systems of Toroidal Field Coils and Central Solenoid and low temperature (4.5 deg. K) irradiation test programme for the insulation of the NET coils are described. Figs.

50944 (IAEA-TECDOC—417, pp 41-63) **Investigations on thickwalled carbon fibre composites for poloidal coil casing design.** Ahlborn, K.; Hartwig, G.; Knaak, S. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R.). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

Production method and sample preparation of carbon fibre composites for poloidal coil are described. The mechanical measurements were performed at a dynamic oil hydraulic machine and at a high frequency resonance machine for fatigue tests. Experimental results - interlaminar shear strength, static bending properties, static tensile test, dynamic tensile tests, thermal fatigue test, and thermal expansion - are given and discussed. 15 refs, 30 figs.

50945 (IAEA-TECDOC—417, pp 159-215) **Neutron and gamma irradiation effects on organic insulating materials for fusion magnets.** Maurer, W. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Technische Physik). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

Available low-temperature neutron and gamma irradiation data for organic insulating materials are collected and compared with room temperature data. Only the most promising polymers in terms of mechanical strength for magnet insulation are taken into account. For characterization and comparison of different materials the 75% dose is used, i.e. the dose, where the mechanical strength is reduced by 25%, and 75% is retained. For room temperature special prepared polyimide and epoxy materials reinforced with glass fibre retained 75% of the mechanical strength up to a dose of 7 x 10/sup 7/Gy. For 5 K irradiation the best epoxy material retained the 75% dose up to 1 x 10/sup 7/Gy, the best polyimide material up to 1 x 10/sup 8/Gy. 77 refs, 5 figs, 6 tabs.

50946 (IAEA-TECDOC—417, pp 217-220) **Experiences with ceramics in the JET ICRH system.** Brinkschulte, H. (Commission of the European Communities, Abingdon, UK. JET Joint Undertaking). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

JET utilises RF waves in the 25-55 MHz range for additional plasma heating. Presently, 3 antennae are in operation each delivering up to 3 MW of RF power to the plasma. Various parts made from 97% pure alumina are employed for electrical insulation and for separation of the evacuated part from the pressurised part of the system. With only little neutron production so far, all ceramics worked satisfactorily. 3 refs, 1 fig.

50947 (IAEA-TECDOC—417) **Insulators for fusion applications. Report of a consultants meeting held in Karlsruhe, 25-27 June 1986.** (International Atomic Energy Agency, Vienna (Austria)). Apr 1987. 233p. (CONF-8606262—). NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681.

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

Design studies for fusion devices and reactors have become more detailed in recent years and with this has come a better understanding of requirements and operating conditions for insulators in these machines. Ceramic and organic insulators are widely used for many components of fusion devices and reactors namely: radio frequency (RF) energy injection systems (BeO, Al/sub 2/O/sub 3/, Mg Al/sub 2/O/sub 4/, Si/sub 3/N/sub 4/); electrical insulation for the torus structure (SiC, Al/sub 2/O/sub 3/, MgO, Mg Al/sub 2/O/sub 4/, Si/sub 4/Al/sub 2/O/sub 2/N/sub 6/, Si/sub 3/N/sub 4/, Y/sub 2/O/sub 3/); lightly-shielded magnetic coils (MgO, MgAl/sub 2/O/sub 4/); the toroidal field coil (epoxies, polyimides), neutron shield (B/sub 4/C, TiH/sub 2/); high efficiency electrical generation; as well as the generation of very high temperatures for high efficiency hydrogen production processes (ZrO/sub 2/ and Al/sub 2/O/sub 3/ - mat, graphite and carbon - felt). Timely development of insulators for fusion applications is clearly necessary. Those materials to be used in fusion machines should show high resistance to radiation damage and maintain their structural integrity. Now the need is urgent for a variety of radiation resistant materials, but much effort in these areas is required for insulators to be considered seriously by the design community. This document contains 14 papers from an IAEA meeting. It was the objective of this meeting to identify existing problems in analysing various situations of applications and requirements of electrical insulators and ceramics in fusion and to recommend strategies and different stages of implementation. This meeting was endorsed by the International Fusion Research Council. Refs, figs and tabs.

50948 (IAEA-TECDOC—417, pp 7-13) **Nuclear radiation effects in low-temperature dielectrics: investigations at SURRC.** Banford, H.M. (Scottish Universities Research and Reactor Centre, Glasgow, UK). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

Present and proposed work at the Scottish Universities Research and Reactor Centre on the effects of nuclear radiation on certain electrical properties of polymers at the temperature of liquid helium are discussed. The investigations so far have centred on the study of low-density polyethylene (LDPE), where current/voltage characteristics and impulse breakdown voltages have been determined for test specimens irradiated up to 10/sup 6/ Gy at 5K. The proposed work discusses a shift in emphasis to the study of an epoxy resin in conjunction with the application of more elaborate measurement techniques such as Frequency Domain Dielectric Spectroscopy, Thermally Stimulated Currents (TSC) and Chemical Analysis. The objective of this work is to obtain a clearer understanding of the mechanisms of degradation and dielectric failure operating in the electrical insulation of fusion reactor superconducting coils and to develop practical methods of determining material lifetimes. 18 refs.

50949 (IAEA-TECDOC—417, pp 15-23) **Effects of nuclear radiation on electrical properties of low-density polyethylene at 5K.** Banford, H.M.; Frame, R.I.; Tedford, D.J. (Scottish Universities Research and Reactor Centre, Glasgow, UK; Strathclyde Univ., Glasgow, UK. Dept. of Electronic and Electrical Engineering). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

Samples of low-density polyethylene film (LDPE) were irradiated at the temperature of liquid helium to doses of 10/sup 5/ Gy of reactor radiation and 10/sup 6/ Gy of gamma radiation from a / sup 60/Co source. Following irradiation the test specimens were maintained at 5K and subjected to certain electrical tests. Isochro-

nal current/voltage measurements were made on gamma-irradiated samples and the dielectric breakdown strength of all specimens irradiated to 10/sup 5/ Gy was determined using a Marx generator. The results show no significant effect of radiation to 10/sup 5/ Gy on the dielectric strength. Also no significant effect of gamma radiation on the electrical conductivity was evident up to 10/sup 5/ Gy. The results here indicate that the dominant charge transport process was some form of polarisation. At 10/sup 6/ Gy and high applied fields, however, a previously unobserved electric pulse activity was noted, the source of which might be frozen-in space-charge fields. 10 refs, 5 figs.

50950 (IAEA-TECDOC—417, pp 25-32) **Liquid helium irradiation facility.** Banford, H.M. (Scottish Universities Research and Reactor Centre, Glasgow, UK). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

A much simpler lower-powered system - a liquid helium irradiation facility - was designed to irradiate samples of electrical insulation at the temperature of liquid helium both in the UTR-300 reactor and the /sup 60/Co gamma source at SURRC. Following irradiation to the desired dose, the cryostat with the insulation sample still held cold at — 5 K is removed from the nuclear radiation flux to a test area where electrical measurements are performed to investigate remanent radiation effects on certain electrical characteristics of the test specimens. 5 refs, 4 figs.

50951 (IAEA-TECDOC—417, pp 65-93) **Ceramic insulator materials for RF windows.** Dienst, W.; Heidinger, R. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Material- und Festkoerperforschung). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

The Nuclear Fusion Project of KfK is participating in the ivestigation of ceramic insulator materials for the construction of windows for the introduction of millimeter-waves to plasma heating. A survey is given of high-performance insulator materials available and of their properties, specifically in respect of the low level of dielectric loss required. Major importance is attached to the measuring methods and results for dielectric loss at relevant radiofrequency. In view of the decisive role that the resistance to crack formation under thermal stresses will play for the technical application, the following material properties are also investigated at KfK: thermal conductivity, Young's modulus, bend strength. Detailed information is given of the specimen stock on hand, and of the measuring results already obtained. It is a main purpose of the examination of the material properties at KfK to prepare irradiation experiments which are to recognize irradiation-induced property changes. There are several common CEA/KfK reactor irradiation experiments which are to be conducted in 1986/87. The KfK specimen sets and the irradiation conditions are characterized. 23 refs, 4 figs, 12 tabs.

50952 (IAEA-TECDOC—417, pp 95-96) **Mechanical performance of electrical insulation systems at cryogenic temperatures.** Nyilas, A. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Technische Physik). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

Requirements for electrical insulation materials of toroidal and poloidal field coils including the clean conditions during the manufacturing, the conditions of the current standards for the shear strength measurements for homogeneous materials and the irradiation resistance are discussed in this report.

50953 (IAEA-TECDOC—417, pp 97-112) **Insulator applications in a tokamak reactor.** Leger, D. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette, France. Inst. de Recherche Technologique et de Developpement Industriel, IRDI). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

Insulators and, among insulators, ceramics have large potential applications in fusion reactors. Graphite silicon carbide and titanium carbide are potential candidates for the first wall protection against disruptions. Alumina, spinel and magnesium oxyde should be used as insulating materials for windows that must be equipped with radio frequency heating antennas. To minimise eddy currents losses and to limit electromagnetic forces in the nuclear island, ceramic electrical current breakers have to be foreseen. Diagnostics must be, in general, separated from the plasma by ceramic windows. The future magnetic fusion devices which will make a large use of superconducting coils, organic insulator like epoxy resins and polyimides are largely present in such coils but are very sensitive to radiation effects, so ceramic insulators are candidates for this purpose. Other possible utilisations of ceramic insulators exist like for electrical insulation of the vacuum pump motors. Facing to these uses of insulators in fusion devices, their behaviour in a large neutron and gamma-ray field is of utmost importance. Large amounts of measurements have been taken in fission reactors for the largest part of candidate materials. However, effects of 14 MeV neutrons and high gamma-ray fields (> 10/sup 7/Gy) are unknown. 15 refs, 9 figs, 4 tabs.

50954 (IAEA-TECDOC—417, pp 113-188) **Defects and radiation induced defects in insulating materials.** Duraud, J.P.; Gautier, M.; Vigouroux, J.P. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette, France. Inst. de Recherche Technologique et de Developpement Industriel, IRDI). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

The study of defects in ceramic type materials (Al/sub 2/O/sub 3/, SiO/sub 2/, AlN) enables one to understand the evolution of their properties when submitted to various radiations. The relation between their electronic structure and the mechanical, optical, electrical behaviour of insulators is a key point for material assessment in C.T.R. The electronic structure of bulk samples, has been studied by electron spectroscopy (photoemission and electron energy loss spectroscopy). Furthermore radiation effects produced under electronic excitation are presented. 9 refs.

50955 (IAEA-TECDOC—417, pp 119-157) **Radiation damage to polymers and fibre composites.** Hartwig, G. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R. Inst. fuer Material- und Festkoerperforschung). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

The resistance to radiation is one important design criterium for the applications of polymeric materials in fusion technology. The various material properties have a different dependence of degradation on radiation dose. The degradation of the most important properties is discussed. Special emphasis is placed on properties which are critical design parameters. Several properties are still sufficient when other have seriously degraded. Since fibre glass and carbon fibres are more resistant to radiation the most sensitive components of fibre composites are the polymeric matrices. There are three categories of polymers: polyimides, epoxies and thermoplastic polymers which have in this sequence a decreasing resistance to radiation and an increasing cryogenic ductility. It depends on the special application to find a reasonable compromise between both features. The applicability of polymeric materials to components with different profiles of requirements are discussed. In the appendix some of the original papers are briefly reviewed. Figs and tabs.

50956 (IAEA-TECDOC—417, pp 221-225) **Method for improving ceramics for windows for electron cyclotron wave launchers in a reactor.** Vassiliadis, M. (Max-Planck-Institut fuer Plasmaphysik, Garching, Germany, F.R.). Apr 1987. NTIS (US Sales Only), PC A11/MF A01. File Number DE87703681. (CONF-8606262—).

From IAEA consultants meeting on insulators for fusion applications; Karlsruhe, F.R. Germany (25 Jun 1986).

In this paper ways for reinforcing conventional window materials for electron cyclotron wave launchers in a reactor are proposed. A toughening mechanism can be applied to an alumina matrix by zirconia. According to preliminary measurements the RF properties of the alumina matrix are unaffected by being reinforced by 15% in weight of zirconia particles. Such a material can have a bending strength of 630 MPa. 4 refs, 2 figs.

50957 (IPPJ-REV—2, pp 304-318) **Spatial dephasing of relativistic plasma wave in beat wave acceleration.** Takabe, H.; Mima, K. (Osaka Univ., Suita, Japan. Inst. of Laser Engineering). Sep 1986. NTIS (US Sales Only), PC A16/MF A01. File Number DE87780166. (CONF-8602116—).

From US/Japan workshop on statistical plasma physics; Nagoya, Japan (17 Feb 1986).

The generation of relativistic plasma wave by collinear laser lights is studied, and the effects of pump depletion and cascading of the laser lights are investigated associated with the acceleration of the electrons injected with relatively low energy. It is emphasized that in relatively early stage (ω_{pe}/ t — 80 x 2π) the combination of the pump depletion and relativistic frequency shift leads the phase of the plasma wave to be random in space, consequently terminating efficient acceleration of the electrons.

50958 (JAERI-M—86-189, pp 84-107) **Studies on steps affecting tritium residence time in solid blanket.** Tanaka, Satoru. (Tokyo Univ., Tokai, Ibaraki, Japan. Nuclear Engineering Research Lab.). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

For the self sustaining of CTR fuel cycle, the effective tritium recovery from blankets is essential. This means that not only tritium breeding ratio must be larger than 1.0, but also high recovering speed is required for the short residence time of tritium in blankets. Short residence time means that the tritium inventory in blankets is small. In this paper, the tritium residence time and tritium inventory in a solid blanket are modeled by considering the steps constituting tritium release. Some of these tritium migration processes were experimentally evaluated. The tritium migration steps in a solid blanket using sintered breeding materials consist of diffusion in grains, desorption at grain edges, diffusion and permeation through grain boundaries, desorption at particle edges, diffusion and percolation through interconnected pores to purging stream, and convective mass transfer to stream. Corresponding to these steps, diffusive, soluble, adsorbed and trapped tritium inventories and the tritium in gas phase are conceivable. The code named TTT was made for calculating these tritium inventories and the residence time of tritium. An example of the results of calculation is shown. The blanket is REPUTER-1, which is the conceptual design of a commercial reversed field pinch fusion reactor studied at the University of Tokyo. The experimental studies on the migration steps of tritium are reported. (Kako, I.).

50959 (JAERI-M—86-189, pp 117-125) **LiF-PbF/sub 2/ blanket system.** Kawamura, Kazutaka. (Tokyo Inst. of Tech., Japan. Research Lab. of Nuclear Reactor). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

In nuclear fusion reactors which employ D-T fuel cycle, tritium breeding is required. While lithium is a most favorable element to breed tritium, the selection of its chemical and physical forms has not been specified so far. Liquid breeding materials are advantageous because those do not suffer radiation damage and phase transformation, and their thermal conductivity is high. Molten salts seem to be minor candidates, but they are still attractive since their pumping load is much less than that of liquid metals under a high magnetic field. Among lithium salts, LiF is a prominent candidate as a molten blanket material, but since LiF has the melting point as high as 842 deg C, another compound should be added to obtain a moderate operating temperature. As such additives, a compound containing a neutron multiplier, for example Be or Pb, is favorable. Therefore, as a candidate of the molten salt breeding materials, liquid LiF-PbF/sub 2/ system was proposed. The tritium release behavior of cold-pressed pellets and cold-pressed and sintered pellets of LiF-PbF/sub 2/ irradiated by thermal neutrons, the tritium release behavior of solidified pellets of LiF-PbF/sub 2/ irradiated by thermal neutrons, the phase diagram of LiF-PbF/sub 2/ system, and the corrosion resistance materials against LiF-PbF/sub 2/ melt are reported. (Kako, I.).

50960 (JAERI-M—86-189, pp 152-161) **Accumulation and desorption of hydrogen isotopes bombarded on Ti-coated surface of metals.** Higashi, K.; Kitagawa, K.; Mizushima, K.; Muraoka, M.; Fujita, H. (Kyoto Univ., Japan. Dept. of Nuclear Engineering). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

Applying the depth-profiling technique using the nuclear reaction D(/sup 3/He,P)/sup 4/He, hydrogen behaviors in Ti-deposition layer on substrate of SS304 and nickel have been observed fairly in details. Titanium is deposited on polished surface of SS304 stainless steel and nickel. Implantation of deutrium ions is carried out at three different energies. The low energy implantation (< 1 KeV) is performed by using the experimental set-up for plasma driven permeation of hydrogen. By keeping the probe voltage at 1 KV, a metal specimen is exposed by a flux of deutrium ions of energy less than 1 KeV. Implantation of 15 and 150 KeV is carried out by two different Cockcroft-Walton accelerators. The experimental results are as follows. 1) It seems to be difficult for implanted hydrogen to diffuse into the endothermic substrate. Implanted hydrogen tends to accumulate within the Ti-deposition layer. The upper limit of hydrogen concentration in Ti-deposition layer is ~200 a/o. 2) Concentration of hydrogen in Ti-deposition layer changes discontinuously by annealing within narrow ranges of temperature (< 100 deg C, ~300 deg C and ~400 deg C). There are three different energy states for hydrogen in Ti-deposition layer corresponding to concentration ranges of < 50 a/o, 50 ~ 100 a/o and > 100 a/o. By annealing at 450 deg C or higher temperature, all of hydrogen get out into gas-phase through the surface. 3) The thermal behavior of hydrogen in deposition layer is quite different in some cases from that of the metal. (Nogami, K.).

50961 (JAERI-M—86-189, pp 162-176) **Implications of recent implantation-driven permeation experiments for fusion reactor safety.** Longhurst, G.R.; Anderl, R.A.; Struttmann, D.A. (Idaho National Engineering Lab., Idaho Falls, USA). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

Experiments have been conducted to observe and investigate the implantation-driven permeation characteristics of several materials considered for fusion reactor structures. Materials tested include 304 and 316 stainless steels, Primary Candidate Alloy (a titanium modified 316 stainless steel), pure alpha iron and the ferritic steel HT-9, and the vanadium alloy V-15Cr-5Ti. Wafers of these materials each 0.5-mm thick were exposed to D/sub 3//sup +/ ions at energies and beam intensities representative of that seen by surfaces exposed to the plasma of a fusion reactor. The rates of permeation and reemission of deuterium from the target specimens were observed as was the spectrum of ion species sputtered from the target surface. From these experiments it was concluded that surface conditions strongly influence the implantation-driven permeation of hydrogen isotopes in these circumstances. The highest permeating fraction seen was in the vanadium alloy tests. This material showed about 750 times the permeating fraction of the austenitic steels and about 170 times that of the ferritic materials. To properly analyze the experimental results it was necessary to use a two-dimensional transport code. Analysis suggests that while beam-sputtering effects are important in all the materials tested, for the vanadium alloy, radial diffusion in the target also strongly influences the results. Safety implications are that while hydrogen isotope concentrations in fusion structures may not be large enough to alter their mechanical properties substantially, there will probably be tritium inventories in those structures sufficiently large that unmitigated release could be hazardous.

50962 (JAERI-M—86-189, pp 186-201) **Tritium diffusion in metals under thermal gradient.** Sugisaki, Masayasu. (Kyushu Univ., Fukuoka, Japan. Faculty of Engineering). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

The heat of transport Q* of H, D and T was determined in V, Nb, Ta and Ti by measuring the redistribution of hydrogen isotopes induced by the thermal gradient. The large isotope dependence of Q* was observed in V, Nb and Ta, but not confirmed in Ti. The heat of transport Q* of hydrogen isotopes in other metals and alloys such as Ni, α-Fe, V-Nb, V-Cr and V-Ti reported by other investigators was reviewed and the common trend of isotope dependence of Q* such that Q/sub T/* > Q/sub D/* > Q/sub H/* was pointed out for hydride-forming metals and alloys. The influence of the thermomigration upon the tritium permeation through metals and alloys was discussed on the basis of the experimental data of Q* and the general formulation of tritium recycling and permeation. It was pointed out that the tritium permeation was considerably enhanced by the thermomigration in the case of hydride-forming metals and alloys and suppressed in the case of non hydride-forming metals and alloys, and that the isotope dependence of the enhancement cannot be neglected.

50963 (JAERI-M—86-189, pp 202-208) **Tritium retention in graphite.** Causey, R.A.; Wilson, K.L. (Sandia National Labs., Livermore, CA, USA). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

The hydrogen isotope retention for samples exposed to a high fluence of 100 eV deuterons and tritons has been measured for the graphites ATJ-2000, Great Lakes H-451, Schunk and Ebe FE-159, and FMI 4-D weave carbon composite. These measurements were performed at a series of temperatures, and results were compared to earlier results for POCO AXF-50 graphite. Both grain size and amount of open porosity were found to affect the amount of retention.

50964 (JAERI-M—86-189, pp 139-151) **Swelling of lithium ceramics during irradiation.** Hollenberg, G.W. (Westinghouse Hanford Co., Richland, WA, USA). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

Lithium ceramics are considered for the purpose of tritium production in D-T fusion power plants. One of the many issues which must be resolved before the blankets containing lithium ceramics are brought into service is the degree of stability which can be expected from these new materials. The swelling of solid breeder materials can directly impact the design lifetime of blankets. The accommodation of swelling in the design correspondingly requires compromise in the overall performance of blankets. Recently, an irradiation experiment was completed at moderate burnup level to observe the swelling of solid breeder materials. The pellets of Li/sub 2/O, Li/sub 4/SiO/sub 4/, Li/sub 2/ZrO/sub 3/ and LiAlO/sub 2/ were irradiated in the fast neutron spectra of the EBR-2 reactor at 500, 700 and 900 deg C for 105, 192 and 297 full power days (FPD). The pellets were 85 % of the theoretical density except two cases. After the irradiation, the fuel pins were neutron-radiographed in order to examine the configuration of the solid breeder materials within the claddings. Finally, the lithium-6 burnup was determined. The integrity of pellets was the best in Li/sub 2/ZrO/sub 3/, and the fragmentation of pellets was the most in Li/sub 4/SiO/sub 4/, due to their thermal conductivity and thermal expansion. Pellet swelling was very small in Li/sub 2/ZrO/sub 3/ and LiAlO/sub 2/. (Kako, I.).

50965 (JAERI-M—86-189, pp 177-185) **Permeation of deuterium implanted into nickel.** Nagasaki, T.; Yamada, R.; Saidoh, M.; Katsuta, H. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

While some models for plasma driven permeation (PDP) have been proposed, there are not enough data to be compared with the models. Even the dependence of permeation flux on such parameters as temperature, incident flux, and incident energy has scarecely been measured systematicaly yet. Thus, PDP experiments are made to study how the permeation flux at steady state depends on parameters and to identify the rate-limiting processes by comparing the experimental results with a model. Deutrium implantation is carried out using a 5 kV accelerator with a duoPIGatron ion source, an analyzing magnet and an electrostatic lens. The base pressure in the target chamber of the accelerator system is typically 2 x 10/sup -6/ Pa; it rises up to 8 x 10/sup -5/ Pa during implantation. The dependence of the permeation flux increment caused by implantation (Jp) on temperature, beam current, rate of GDP and incident energy. In the experiments, the rate of gas driven permeation (GDP) is comparable to that of PDP above -300 deg C. Thus, the Doyle's model is slightly modified so that it can be applied to the experimental data. An expression for Jp is derived for three different cases: where the rate of hydrogen transport in the material is recombination limited in both sides of the implantation plane (RR regime), where it is recombination limited in the injection side and diffusion limited in the back side (RD regime), and where it is diffusion limited in both sides (DD regime). It is found that the transport regime is basically RD above -400 deg C and DD below -300 deg C under the experimental conditions used. (Nogami, K.).

50966 (JAERI-M—86-189, pp 43-51) **Tritium processing technology development at the tritium systems test assembly.** Anderson, J.L. (Los Alamos National Lab., NM, USA). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

The Tritium Systems Test Assembly (TSTA) at the Los Alamos National Laboratory has been operating with tritium since June 1984. Presently there are some 50 g of tritium in the main processing loop. This 50 g has been sufficient to do a number of experiments involving the cryogenic distillation isotope separation system and to integrate the fuel cleanup system into the main fuel processing loop. In January 1986 two major experiments were conducted. During these experiments the fuel cleanup system was integrated, through the transfer pumping system, with the isotope separation system, thus permitting testing on the integrated fuel processing loop. This integration of these systems leaves only the main vacuum system to be integrated into the TSTA fuel processing loop. In September 1986 another major tritium experiment was performed in which the integrated loop was operated, the tritium inventory increased to 50 g and additional measurements on the performance of the distillation system were taken. In the period June 1984 through September 1986 the TSTA system has processed well over 10/sup 8/ Ci of tritium. Total tritium emissions to the environment over this period have been less than 15 Ci. Personnel exposures during this period have totaled less than 100 person-mRem. To date, the development of tritium technology at TSTA has proceeded in progressive and orderly steps. In two years of operation with tritium, no major design flows have been uncovered.

50967 (JAERI-M—86-189, pp 61-71) **Test production of tritium in 1000 Ci level from /sup 6/Li-Al alloy target.** Tanase, M.; Kato, M.; Kurosawa, K.; Motoishi, S.; Okane, S.; Sugai, H.; Fujie, M.; Onoma, K.; Yamabayashi, H. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

Facilities for tritium production in a 1000 Ci level were constructed. Gaseous tritium was extracted from neutron-irradiated / sup 6/Li-Al alloy targets by heating them at 700 deg C under vacuum and collected in a uranium-getter. The tritium was recovered with a yield of about 100 % and the isotopic purity of the product was about 95 %. Through the production run, no leakage of tritium from the facilities was observed.

50968 (JAERI-M—86-189, pp 72-83) **Assessment of tritium issues and data requirements for liquid breeders.** Sze, Dai-Kai. (Argonne National Lab., IL, USA). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

Liquid breeding materials have received wide attention in the U.S. fusion reactor design studies over the past few years. There are major uncertainties of the tritium recovery system design over the constraints of tritium inventory, tritium containment, and recovery system costs. The key problems are identified, and the data required to resolve these issues are discussed.

50969 (JAERI-M—86-189, pp 209-220) **Conversion of tritium gas to tritiated water at low tritium concentration.** Noguchi, H.; Easterly, C.E.; Bennett, M.R. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

The conversion reaction of tritium gas (T/sub 2/) to tritiated water was studied experimentally at initial tritium concentrations between 2.6 x 10/sup -4/ and 1.3 Ci/m/sup 3/ in air. Effects of water vapor and catalysts on the conversion reaction were also examined. The potential catalysts, stainless steel, copper, paint and platinum black were used. It was found that first-order rate constants for the reaction in air are independent of initial tritium concentration, and that there is no effect of water vapor on the reaction. The conversion was insensitive to the presence or absence of stainless steel and copper. Paint, which did not influence the rate constant, sorbed T/sub 2/ and HTO, but the latter was desorbed from the paint by heating. Platinum black produced a remarkable increase of the rate constant.

50970 (JAERI-M—86-189, pp 221-236) **Analysis and measurement of tritium by mass spectrometer, ionization gauge and secondary electron multiplier.** Matsuyama, M.; Miyake, H.; Ichimura, K.; Watanabe, K. (Toyama Univ., Japan. Tritium Research Center). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

To apply mass spectrometers and ionization gauges to D-T burning experiments in magnetic fusion devices, we examined the performance and sensitivity of a quadrupole mass spectrometer and B-A gauges for hydrogen isotopes (H/sub 2/, D/sub 2/, T/sub 2/, etc). In addition, we also examined the utility of a secondary electron multiplier(Ceratron) as a pressure gauge of tritium. It was revealed that the relative sensitivities of the mass spectrometer for each isotope molecules with respect to H/sub 2/ was essentially the same as those of B-A gauges except T/sub 2/. It was also found that the relative sensitivities of B-A gauges for the isotopes were very close to unity except HD and T/sub 2/. With regard to Ceratron, the count rate was proportional to the partial pressure of tritium in a rage from 1.3 x 10/sup -6/ to 1.3 x 10/sup -3/ Pa.

50971 (JAERI-M—86-189, pp 245-260) **Brief description of experimental apparatus for fuel cleanup process.** Konishi, Satoshi; Yoshida, Hiroshi; Naruse, Yuji. (Japan Atomic Energy Research Inst., Naka, Ibaraki. Naka Fusion Research Establishment). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

An experimental apparatus for the development of Fuel Cleanup System is being designed and fabricated at the Tritium Process Laboratory. The function of the system is continuous processing of a simulated plasma exhaust and separation of hydrogen isotopes and impurity elements in it. Main components are palladium diffusers, a catalytic reactor, freezers, an electrolysis cell and zirconium-cobalt beds. The apparatus will be installed in a glovebox in summer. 1987 and tests with tritium will initiate early in 1988.

50972 (JAERI-M—86-189, pp 13-19) **Overview of the U.S. magnetic fusion tritium research program.** Nardella, G.R. (Department of Energy, Washington, DC, USA. Office of Fusion Energy). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

Tritium research has been going on for nearly 30 years in the U.S., and this solid base of information enabled the significant start of the U.S. Magnetic Fusion Energy Program. To achieve on limited budget a sufficient data base to build such a project in the suggested time frame (1990s), U.S.-Japan fusion cooperation is in progress. Successful collaboration has already occurred such as the integral neutronics experiment performed at the Fusion Neutron Source facility in Japan, and the small scale tritium component test performed at the Tritium System Test Assembly facility in the U.S. In the U.S. Magnetic Fusion Energy Program, tritium research is conducted in five general areas, that is, processing of plasma exhaust and blankets, safety, blanket development and breeding performance, material studies, and health and environmental effects. The Tritium System Test Assembly located at Los Alamos National Laboratory was completed in September 1982, and consists of a large gas loop which can simulate a deuterium-tritium fuel cycle system. During FY 1986, the TSTA performs the operational test of the Fuel Cleanup System, the Isotope Separation System and others. The activities in the above five areas are reported. (Kako, I.).

50973 (JAERI-M—86-189, pp 20-24) **Fusion fuel research activities of universities in Japan.** Okamoto, Makoto. (Tokyo Inst. of Tech., Japan. Research Lab. of Nuclear Reactor). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

As for tritium science and technology, the basic studies are carried out in universities, and the technology-oriented studies are carried out in Japan Atomic Energy Research Institute. Universities have only low level laboratories up to 500 Ci of tritium, so there is the limitation to carry out the practical scale experiment. However, these low level laboratories can contribute to the understanding of the phenomena, the accumulation of quantitative basic data, the confirmation of innovative ideas, the education and training of young scientists and so on. The tritium flow in a fusion system consists of four subflows, that is, primary fuel flow, secondary fuel flow, the permeation flow through the materials in contact with plasma and leak flow to the environment. Along with the above four tritium flows, the research activities have been focused on the following subjects since 1983: breeding chemistry and technology, tritium cleanup technology, recovery and storage of tritium, diffusivity of hydrogen isotopes, isotope separation, plasma-driven permeation and hydrogen plasma chemistry, waste treatment and others. The research themes and the working institutes, and the prospect of the trend of research are shown. (Kako, I.).

50974 (JAERI-M—86-189, pp 25-42) **Tritium fueling for ICF pellet target.** Norimatsu, Takayoshi; Takagi, Masaru; Nakai, Sadao; Yamanaka, Chiyoe. (Osaka Univ., Suita, Japan. Inst. of Laser Engineering). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

In laser fusion research, a glass of plastic microballoon filled with pressurized deuterium-tritium gas is employed as a target. The D-T gas is loaded into the microsphere by heating in high pressure D-T gas to induce diffusion through the glass wall. For the high pressure D-T loading, the technical issues have been extensively investigated, such as pumping of D-T gas up to 30 MPa, reduction of tritium leak due to diffusion from a filling system, process monitoring around 1.3 Ci/cc STP, recovery of tritium from vaccum lines, and nondestructive fuel assay in a plastic balloon. In this report, the outline of D-T filling process, the reduction of tritium leak from a filling vessel by gold plating, the process monitoring using beta scintillation powder and so on are described. Various D-T filled

targets were fabricated for the implosion experiment with the Gekko-12 glass laser system, which has achieved the neutron yield as high as 4 x 10/sup 12/. Tritium fueling system and the technical issues for tritium handling have been studied and developed. The gold plating applied to the outside surface of a filling vessel traps hydrogen by carbon contained in the gold as impurity, and reduces tritium permeation. The luminance emitted by Zn/sub 2/SiO/sub 4/ showed the good linearity to the partial pressure of tritium in D-T mixture. (Kako, I.).

50975 (JAERI-M—86-189, pp 52-60) **Tritium scavenging from gas stream under various conditions.** Nishikawa, Masabumi. (Kyushu Univ., Fukuoka, Japan). Jan 1987. NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007. (CONF-8610157—).

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

It has been conceptualized to set up the multi-barrier containment system for tritium handling facilities, and it has been also discussed to apply catalytic treatment to tritium or tritiated water in the atmosphere with or without chemically active component. It is considered that four methods are available for scavenging tritium from gas stream, that is, oxidation of tritium and following adsorption of the oxidized tritium, fixation of tritium as crystal water by isotope exchange reaction, formation of tritiated metals, and adsorption at cryogenic temperature. The performance of various catalysts has been experimented and compared under various conditions, and the evaluation of the results is shown. The proper voidage in a packed bed can be obtained with almost all catalysts, and almost all metal oxide catalysts have the good oxidation capacity. These metal oxide catalysts tested have almost no activity in the isotope exchange reaction, and do not show poisoning effect by water vapor because of the high temperature to be used. The oxidation rate of tritium with precious metal catalysts is superior to that with metal oxide catalysts though a fair quantity of oxygen is required. The rate of isotope exchange reaction with precious metal catalysts is excellent. The tritium is adsorbed water can be easily released by purging with dry gas at high temperature. (Kako, I.).

50976 (JAERI-M—86-189) **Proceedings of the Japan-US workshop on tritium technology. P89 in the Japan/US fusion cooperation program.** (Japan Atomic Energy Research Inst., Tokyo). Jan 1987. vp. (CONF-8610157—). NTIS (US Sales Only), PC A14/MF A01. File Number DE88780007.

From Tritium technology workshop; Tokyo, Japan (22 Oct 1986).

Separate abstracts were prepared for the individual papers of the proceedings. (WRF)

50977 (LBL—22713) **Analysis of an induction linac driver system for inertial fusion.** Hovingh, J.; Brady, V.O.; Faltens, A.; Keefe, D.; Lee, E.P. (Lawrence Livermore National Lab., CA (USA); Lawrence Berkeley Lab., CA (USA)). Jul 1987. Contract AC03-76SF00098. 39p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000681.

A linear induction accelerator that produces a beam of energetic (5 to 20 GeV) heavy (130 to 210 amu) ions is a prime candidate as a driver for inertial fusion. Continuing developments in sources for ions with charge state greater than unity allow a potentially large reduction in the driver cost and an increase in the driver efficiency. The use of high undepressed tunes ($\sigma_0 \approx 85°$) and low depressed tunes ($\sigma \approx 8.5°$) also contributes to a potentially large reduction in the driver cost. The efficiency and cost of the induction linac system are discussed as a function of output energy and pulse repetition frequency for several ion masses and charge states. The cost optimization code LIACEP, including accelerating module alternatives, transport modules, and scaling laws, is presented. Items with large cost-leverage are identified as a guide to future research activities and development of technology that can yield substantial reductions in the accelerator system cost and improvement in the accelerator system efficiency. Finally, a cost-effective strategy using heavy ion induction linacs in a development scenario for inertial fusion is presented. 34 refs., 6 figs., 7 tabs.

50978 (LBL—22750, pp 63-76) **Heavy-ion fusion accelerator research.** 15 Apr 1987. NTIS, PC A05/MF A01. File Number DE87013955.

In Accelerator and Fusion Research Division: Summary of activities, 1986.

The effort at LBL, in terms of Inertial-Confinement Fusion, is concentrated on drivers based on heavy-ion beams (which can be produced reliably and efficiently at high repetition rates) - in particular, on heavy-ion induction linear accelerators. The attractions of this latter concept, in comparison with the heavy-ion rf linacs being studied in West Germany, Japan, and the USSR, are its simplicity, the considerable experience accrued in its application to high-current electron-beam acceleration, and the ease with which it can be extrapolated to large facilities on the basis of experiments with smaller test accelerators. Current plans for exploring the physics and technology of induction linacs involve a series of increasingly sophisticated experiments. The first, which continued to yield results of fundamental significance for our understanding of high-current heavy-ion beams, is the three-year-old single-beam transport experiment (SBTE). Second is the multiple-beam experiment (MBE-4), the apparatus for which is now nearing completion. This experiment is already exploring the physics of four independent beams as they are accelerated and transported through a multigap accelerating structure. Most significantly, the novel feature of current amplification which will be required in a driver has already been demonstrated. Finally, proposed is a much larger Induction Linac System Experiment (ILSE), which would address the main physics and technology issues of a full-size heavy-ion fusion reactor driver, at about a one-tenth scale for many key accelerator parameters.

50979 (LBL—22750, pp 77-91) **Magnetic fusion energy.** 15 Apr 1987. NTIS, PC A05/MF A01. File Number DE87013955.

In Accelerator and Fusion Research Division: Summary of activities, 1986.

Since about 1975, LBL has been an active player in the national magnetic fusion program, primarily in its leading role as developer of neutral-beam systems for major experiments at Princeton, Livermore, and GA Technologies in San Diego. These experiments, unlike the self-sustaining reactors of the future, typically run for only a fraction of a second (at most, a few seconds) and thus require an influx of energy to heat the plasma with every pulse. Energetic neutral beams - usually either hydrogen or deuterium atoms - continue to be the method of choice for supplying this energy in most of today's large experiments. Historically, then, these efforts have been directed toward the development of sources of either positive or negative ions, systems for accelerating and transporting these ions, and means of efficiently neutralizing the ions to produce the required neutral atoms. During the past year, work in these same areas has had a much broader base - in part because the near-term needs of the fusion program have been satisfied with the success of the positive-ion-based Common Long Pulse Source. Ongoing efforts thus focus on negative-ion systems for the much larger fusion experiments of the distant future, for industrial applications (perhaps including ion implantation in semiconductors), and for defense. The interest in negative ions is based mainly on the fact that, at high energies (as needed, for example, to penetrate the larger plasma volumes of future fusion experiments or reactors), positive ions cannot be efficiently neutralized.

50980 (NRL-MR—6061) **The Rayleigh-Taylor instability in ablatively accelerated targets with 1, 1/2 and 1/4 μm laser light: Interim report.** Emery, M.H.; Dahlburg, J.P.; Gardner, J.H. (Naval Research Lab., Washington, DC (USA)). 22 Sep 1987. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000272.

We present the results of a series of detailed numerical simulations of the Rayleigh-Taylor instability in laser ablatively accelerated targets for a fairly wide range of initial conditions. It is shown that the Rayleigh-Taylor growth rate in an ablative environment is a strong function of the laser wavelength. For perturbation wavelengths about 3 times the inflight target thickness, the ratios of the numerical growth rates to the classical growth rates are of the order of 1/1.5, 1/2.5 and 1/3.5 for 1, 1/2 and 1/4 μm laser light, respectively. The numerical results are in good agreement with our theoretical model, based on the ablative convection of vorticity away from the unstable ablation front. These results provide strong

evidence for the viability of high-aspect-ratio shells in direct-drive laser fusion.

50981 **(UCRL—96198) Fusion neutron irradiation of Ni(Si) alloys at high temperature.** Huang, J.S.; Guinan, M.W.; Hahn, P.A. (Lawrence Livermore National Lab., CA (USA)). Sep 1987. Contract W-7405-ENG-48. 19p. (CONF-871036—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000047.

From 3. international conference on fusion reactor materials; Karlsruhe, F.R. Germany (4 Oct 1987).

Two Ni-4% Si alloys, with different cold work levels, are irradiated with 14 MeV fusion neutrons at 623 K, and their Curie temperatures are monitored during irradiation. The results are compared to those of an identical alloy irradiated by 2 MeV electrons. The results show that increasing dislocation density increases the Curie temperature change rate. At the same damage rate, the Curie temperature change rate for the alloy irradiated by 14 MeV fusion neutrons is only 6 to 7% of that for an identical alloy irradiated by 2 MeV electrons. It is well known that the migration of radiation induced defects contributes to segregation of silicon atoms at sinks in this alloy, causing the Curie temperature changes. The current results imply that the relative free defect production efficiency decreases from one for the electron irradiated sample to 6 to 7% for the fusion neutron irradiated sample. 17 refs., 4 figs., 1 tab.

50982 **Method and apparatus for preventing cyclotron breakdown in partially evacuated waveguide.** Moeller, C.P. (to Dept. of Energy, Washington, DC). US Patent 4,687,616. 18 Aug 1987. Filed date 15 Jan 1986. vp. Patent and Trademark Office, Box 9, Washington, DC 20232.

A method is described of preventing cyclotron breakdown in a partially evacuated waveguide used to insert microwave energy for electron cyclotron heating in a plasma magnetic confinement device comprising the steps of, applying a static magnetic field for confining the plasma in the device and applying an electrostatic field in order to remove electrons to prevent ionization of gas molecules and creation of more electron ion pairs in the waveguide.

50983 **Aurora: Los Alamos multikilojoule angular-multiplexed KrF driver prototype for ICF.** Rosocha, L.A.; Hanlon, J.A.; McLeod, J.; Kang, M.; Kortegaard, B.; Rose, E.A.; Romero, V.O.; Burrows, M.D.; Greene, D.; Goldstone, P.D. (Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). pp 96 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

The Los Alamos National Laboratory (LANL) has participated in programs to apply high-power gas lasers to inertial confinement fusion (ICF). The bulk of this effort has been in the development of CO/sub 2/ laser systems and laser-plasma interaction experiments at a 10.6-μm wavelength. The main hardware element in this program is the Aurora KrF laser system, which is a prototype for using optical angular multiplexing and serial amplification by large electron-beam-driven KrF laser amplifiers to study KrF systems as potential fusion drivers. Aurora will serve as a test-bed for specific laser, optical, and electron-beam-pumping technology aspects of larger KrF fusion systems. The Aurora system is being built in two phases. The first-phase portion of the Aurora system contains all the main optical and laser elements from the front end to the final amplifier output. In the first phase, the front end output is replicated using aperture slicers and beam splitters to produce a 480-ns long pulse train consisting of 96 separate 5-ns pulses. This pulse train is encoded in angular separation, relayed through the amplifier chain by means of the centered optical system and the computer-controlled alignment station, and delivered to a diagnostic station which follows the main power amplifier [large aperture module (LAM)]. The second phase of the system contains the first-phase portion and the additional optical and target hardware needed to stack 48 of the 96 multiplexed and amplified beams into a single multikilojoule 5-ns pulse at the fusion target. The authors give a description of the Aurora system and discuss its present status.

50984 **Aurora laser optical system.** Hanlon, J.A.; McLeod, J. (Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). pp 70-72 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Aurora is the Los Alamos short-pulse high-power krypton fluoride laser system. It is primarily an end-to-end technology demonstration prototype for large-scale UV laser systems of interest for short-wavelength inertial confinement fusion (ICF) investigations. The system is designed to employ optical angular multiplexing and aerial amplification by electron-beam-driven KrF laser amplifiers to deliver to ICF targets a stack of pulses with a duration of 5 ns containing several kilojoules at a wavelength of 248 nm. A program of high-energy density plasma physics investigations is now planned, and a sophisticated target chamber was constructed. The authors describe the design of the optical system for Aurora and report its status. This optical system was designed and is being constructed in two phases. The first phase carries only through the amplifier train and does not include a target chamber or any demultiplexing. Installation should be complete, and some performance results should be available. The second phase provides demultiplexing and carries the laser light to target. The complete design is reported.

50985 **Generation of ninety-six angularly multiplexed KrF beams at Aurora.** Rose, E.A. (Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). pp 110 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Technical Paper TUR5.

The Aurora KrF laser facility is designed to produce ninety-six laser beams at 248 nm with total energy of — 10 kJ. The 5-ns duration beams are angularly multiplexed to allow sequential amplification in electron-beam-pumped amplifiers. These amplifiers operated over a half-microsecond period. Previous to this investigation, all individual components of the Aurora system have been operated independently. As a first step toward integration of the full system, the author operated the front end, beam slicer, small-aperture module (SAM), and angle encoder to generate ninety-six angularly multiplexed beams. These beams have been delivered to the first of the three large amplifiers, which will boost the pulse train energy from <1 J to 10 kJ. Measurements to date have concentrated on the total energy of the pulse train and pulse shapes of the individual beams at positions preceding and following SAM. Measured gain through SAM is — 13 with 20 the target figure. Relative pulse heights are preserved through SAM with the exception of the first pulse of the 12.

50986 **Large-scale KrF systems for inertial confinement fusion based on Aurora experience.** Mc Leod, J. (Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). pp 110 of Proceedings of the conference on lasers and electro-optics. Piscataway, NJ; IEEE Service Center (1987). (CONF-870401—).

From OSA/IEEE conference on lasers and electro-optics (CLEO '87); Baltimore, MD, USA (27 Apr 1987).

Technical Paper TUR6.

The ultimate amplifier in the Aurora system was originally conceived as a stackable module suitable for construction of much larger systems. The name habitually used to describe it, large aperture module (LAM), is derived from this concept. The principal initial objective of what is now named Aurora was to test the viability of this module and obtain working experience with it. Although it is no longer clear that this is the largest feasible amplifier size, or even that a large amplifier size is advantageous, it is still true that the working experience gained in Aurora creates a special place for this particular module size. It is valuable to examine the limitations and difficulties of stacking LAMs. The key concept is aperture combination. This reduces the complexity of the decoder by combining the outputs of several amplifiers in each time channel so that they can be directed to a common large delay mirror. For this to be effective, the relevant group of amplifiers must be placed close

together. A layout containing 128 parallel LAMs in its ultimate gain stage is displayed and explained in detail. An improved version of the LAM might be capable of producing 25 kJ at its output window. This array would then produce 3.2 MJ, of which perhaps 2.8 MJ would reach the target. This layout contains eight separate decoders, each handling the output of a group of sixteen LAMs, arranged symmetrically around a central target chamber. This giant system divides naturally into subsystems which could be built to meet interim objectives.

99 GENERAL AND MISCELLANEOUS

9901 Management

REFER ALSO TO CITATION(S) 51031

50987 **(IAEA-INFCIRC—1-Rev.8) Information circulars.** (International Atomic Energy Agency, Vienna (Austria)). Jun 1987. 91p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87703407.

The document summarizes the information circulars published by the IAEA for the purpose of bringing matters of general interest to the attention of all Members of the Agency. In the main body of the document only those documents which are regarded as likely to be of current interest are listed. A complete numerical list of information circulars with their titles is reproduced in the Annex.

50988 **(INIS-BR—780) Quality assurance in industrial projects.** Secca, M.A.M.C. (Laboratorio Nacional de Computacao Cientifica, Rio de Janeiro (Brazil)). 1986. 1p. (In Portuguese). (CONF-8610317—2-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703527.

From 4. Brazilian symposium on piping and pressure vessels; Salvador, BA, Brazil (28 Oct 1986).

Published in summary form only.

50989 (INIS-mf—10958, pp 72-79) **Automation of information processes in the management and accomplishment of the training of nuclear power plant personnel.** Frimmelova, A.; Kreutz, R.; Trokanova, J. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Part of the technical equipment of the departmental centre for the education, training and in-service training of personnel of Czechoslovak nuclear power plants in Jaslovske Bohunice also includes a computer controlled instruction system. The system incorporates an SM 3-10 computer and a terminal network which is oriented to the instruction of trainees and to processing information for the control and other activities of the centre. The AIS automated information system designed for the control of the centre consists of four subsystems comprising data on the administrative and material and technical provision of instruction, scientific and technical information and information for the centre's managerial staff. Within the instruction process the centre uses two systems: the EXAM system serves the continuous and final evaluation of the knowledge of trainees and the DIDAK system serves the instruction of groups and individuals. (Z.M.).

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 50237

50990 **(ANL—87-23) The SUPRENUM [supercomputer numerical] communications subroutine library for grid-oriented problems.** Hempel, R. (Argonne National Lab., IL (USA)). Jun 1987. Contract W-31109-ENG-38. 52p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000137.

In the application software development of the SUPRENUM project (the German supercomputer project) many parallel grid-oriented algorithms are being programmed, especially multigrid and computational fluid dynamics codes. As the communication tasks are similar, a central SUPRENUM communications library with subroutines covering all communication requirements of the applications programs has been created. By implementing versions of the library for the Intel iPSC hypercube and the planned SUPRENUM machine, full portability of the applications software has been achieved.

50991 **(ANL/MCS-TM—96) Numerical solution of bound constrained problems.** More, J.J. (Argonne National Lab., IL (USA). Mathematics and Computer Science Div.). Aug 1987. Contract W-31109-ENG-38. 13p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000653.

This paper considers the application of projected gradient techniques to the numerical solution of bound constrained optimization problems. An advantage of algorithms based on projected gradients is that they have the ability to drop and add many constraints at each iteration, and to quickly identify the optimal active constraints. This ability is of importance in large scale problems. In contrast, active set strategies restrict the change in the dimension of the working subspace by only dropping or adding one constraint at each iteration. We introduce and motivate the gradient projection method, and survey some of the recent numerical and theoretical results. In particular, we discuss algorithms that combine trust region methods and projected gradient methods. 16 refs.

50992 **(BDX—613-3781) Guardbanding specifications with SPC [statistical process control] application.** Kirkpatrick, R.L. (Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.). Sep 1987. Contract AC04-76DP00613. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000834.

A reasonable assumption in the manufacture and measurement of a product characteristic is that test set variation contributes to the observed random variation of the characteristic in addition to the product variation. A Supplier may use test limits (guardbands) set inside specification limits to preclude the sending of nonconforming product to the Buyer. The Supplier's goals are for very few or no misclassifications of product (especially bad called good) in the Supplier's accepted product which would be submitted to the Buyer. Meeting these goals depends on several factors. This paper reviews an example; quantifies the influencing factors of the product percent defective, the ratio of gage variation to product variation and the guardband limits; provides tables of the misclassification percentages to illustrate the effects of changing these factors; and discusses SPC ratios that may already be available to a user to estimate these factors for the further understanding of the practice of guardbanding. With estimates of these influencing factors, one could make a reasonable setting of a guardband. 6 refs., 7 tabs.

50993 **(CERN—87-04) 1986 CERN School of Computing. Proceedings.** Verkerk, C. (ed.). (European Organization for Nuclear Research, Geneva (Switzerland)). 29 Apr 1987. 335p. (CONF-8608198—). NTIS (US Sales Only), PC A15/MF A01. File Number DE88700003.

From CERN school of computing; Renesse, Netherlands (30 Aug 1986).

These proceedings contain written versions of lectures delivered at the 1986 CERN School of Computing. Two lecture series treated trends in computer architecture and architectural requirements for high-energy physics. Three other courses concentrated on object-oriented programming, on objects in Ada, and on modularization and re-usability. Expert systems, their applications, and knowledge engineering for graphics were treated by three lectures. The programme of the School covered, in addition, practical aspects of networks, buses for high-energy physics, the design of data-acquisition systems, and examples of on-line systems for particle physics experiments. Optical storage methods, software for distributed systems, symbolic formula manipulation, and solid modelling and rendering were also covered. Experience with transputers was the subject of an unscheduled presentation.

50994 **(CONF-871101—3) Sn transport calculations on vector and parallel processors.** Rhoades, W.A.; Childs, R.L. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87010901.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The transport of radiation from the source to the location of people or equipment gives rise to some of the most challenging of calculations. A problem may involve as many as a billion unknowns, each evaluated several times to resolve interdependence. Such calculations run many hours on a Cray computer, and a typical study involves many such calculations. This paper will discuss the steps taken to vectorize the DOT code, which solves transport problems in two space dimensions (2-D); the extension of this code to 3-D; and the plans for extension to parallel processors.

50995 **(CONF-871101—34) The linear characteristic method in XYZ geometry.** Childs, R.L.; Rhoades, W.A. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87011668.

From Joint meeting of the American Nuclear Society and the Atomic Industrial Forum; Los Angeles, CA, USA (15 Nov 1987).

The linear characteristic method (LC) has been previously investigated in XY geometry. In this paper, the implementation of the LC method in the three-dimensional discrete ordinates code TORT is described, and a comparison is made between LC and the other methods used in TORT, namely weighted difference and linear nodal (LN).

50996 **(CONF-871136—1) The pros and cons of using a CAI packadge on a central computer as opposed to a microprocessor: What's your CAI MO - mainframe or micro?.** Handler, B.H. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87011123.

From 29. international conference of the Association for the Development of Computer-Based Instruction of Systems (ADCIS); Oakland, CA, USA (9 Nov 1987).

When determining the compatibilities and differences between the use of the mainframe and microcomputer for use in computer aided instruction (CAI), each should be evaluated on its relative merits for the specific job to be done; authoring, presentation, or both. The alternatives must be evaluated regarding the content, subject matter and specific requirements of the course to be taught. The real issues are managing the CAI package correctly and being sure that the selected approach is educationally sound.

50997 **(CONF-8709128—1) Statistical inference: Computer oriented algorithmic approach.** Bowman, K.O.; Shenton, L.R. (Oak Ridge National Lab., TN (USA); Georgia Univ., Athens (USA)). 1987. Contract AC05-84OR21400. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013874.

From 1. International Association for Statistical Computing world conference; Shizuoka, Japan (17 Sep 1987).

Series for the moments of estimators and statistical functions often rely on a Taylor expansion, which is ultimately subject to modification by an expectation operator. These two phases are not of the same order of difficulty for, in general, it is the expectation of components of the series which quickly defy analytical development. The evolution of the subject in recent decades has been significantly affected by numerical analysis which is computer oriented. General characteristics are hard to define, and this paper illustrates the situations that can arise by briefly describing a few typical cases. Sign patterns and modulus patterns in components of series become discernible through extended computer methods, and this aspect poses many new developments and unsolved problems. 20 refs.

50998 **(DOE/DP/40200—52) Issues in image processing software development for a multi-user, multi-programming environment.** Sampat, N.; Swales, S. (Rochester Univ., NY (USA). Lab. for Laser Energetics). 1987. Contract FC08-85DP40200. 7p. (CONF-871163—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000358.

From SPIE Cambridge symposium on intelligent robots and computer vision; Cambridge, MA, USA (1 Nov 1987).

The general characteristics of a practical image processing system are presented from a software engineering perspective. The system described is targeted for a multi-user, multi-tasking environment in an organization with continuously changing needs. Issues in designing the fundamental software required to achieve such an application-oriented image processing system are discussed. Interactive tools and source code prototypes for enhancing the software and developing extensions to the system are explained. At all stages in the design of this system, software engineering principles such as program portability, readability and maintenance are emphasized. Such an approach in the design of an Image Processing Software System effectively increases programmer productivity and yields a system with high program reliability and dependable long-term maintenance.

50999 **(DOE/ER/25001—31) Center for Supercomputing Research and Development (CEDAR): Progress report for period December 25, 1986-January 24, 1988.** Kuck, D.J.; Davidson, E.S.; Lawrie, D.H.; Sameh, A.H. (Illinois Univ., Urbana (USA). Center for Supercomputing Research and Development). 1987. Contract FG02-85ER25001. 53p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000807.

The Center for Supercomputing Research and Development (CSRD) is pushing the frontiers of computational technology while building the Cedar System, a prototype multiprocessor. Clusters of 8 tightly-coupled processors are being bought from Alliant Computer Systems, which based its system design on earlier University of Illinois work by the CSRD group. CSRD efforts span the hardware, software, and applications areas. The hardware group is designing and building a global network and shared global memory, as well as an Alliant interface. This will allow 4 clusters (of 8 processors) to operate together in 1988 and up to 8 clusters in the future. Synchronization and data sharing are allowed by powerful hardware primitives. The software group is developing a Unix-based multiprocessor operating system and a Parafrase (KAP)-based restructuring compiler. The compiler will transform serial as well as parallel Fortran constructs to exploit the system, dealing with vector as well as multiprocessing parallelism. The applications group is developing parallel algorithms and using them in a number of engineering and scientific applications. Thus, CSRD is working for a rapid architectural increase in speed across a number of applications. If Cedar can be exploited as planned on single jobs, speed-up factors of one thousand per decade will be possible in future implementations.

51000 **(DOE/ER/25009—392) Domain decomposition in distributed and shared memory environments: 1, A uniform decomposition and performance analysis for the NCUBE and JPL Mark IIIfp hypercubes.** Fox, G.C. (California Inst. of Tech., Pasadena (USA)). 1987. Contract AC04-76DP00789;AC03-81ER40050;FG03-85ER25009. 50p. (CONF-8706183—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87013093.

From ICS '87: international conference on supercomputing; Athens, Greece (8 Jun 1987).

A description is provided as to how explicit domain decomposition can lead to implementations of large scale scientific applications which run with near optimal performance on concurrent supercomputers with a variety of architectures. In particular, from a uniform point of view two architectural characteristics are discussed; distributed memory and hierarchical memory where a large relatively slow memory is buffered by a faster cache or local memory. We consider two hypercubes in particular: the commercial NCUBE and JPL's Mark IIIfp with hierarchical memory at each node of a hypercube. We remark on the application of these ideas to other architectures and other concurrent computers. We

present a performance analysis in terms of basic parameters describing the hardware and the applications.

51001 **(DOE/ET/53088—299) pTSC: Data file editing for the Tokamak Simulation Code.** Meiss, J.D. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Sep 1987. Contract FG05-80ET53088. 14p. (IFSR—299). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000306.

The code pTSC is an editor for the data files needed to run the Princeton Tokamak Simulation Code (TSC). pTSC utilizes the Macintosh interface to create a graphical environment for entering the data. As most of the data to run TSC consists of conductor positions, the graphical interface is especially appropriate.

51002 **(EGG-SPAG—7682) Parallelization of hydrocodes on the Intel hypercube.** Hicks, D.L.; Liebrock, L.M.; Mousseau, V.A.; Mortensen, G.A. (Michigan Technological Univ., Houghton (USA); EG and G Idaho, Inc., Idaho Falls (USA)). Apr 1987. Contract AC07-76ID01570. 41p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87012426.

This report describes the Intel hydrocode parallelization project. The project consists of running four solution methods on two test problems. The code used is a modified version of one written for a project on the Heterogeneous Element Processor (HEP). In the course of running these test problems, timings were done to determine the optimal number of processors to use in solving each problem. The final conclusion drawn from this experiment is that while the hypercube architecture is appropriate for this class of problems the high communication overhead combined with too little memory makes the Intel hypercube a poor implementation target.

51003 **(FNAL/C—87/139) NULLJOB product.** Hughart, N.; Ritchie, D. (Fermi National Accelerator Lab., Batavia, IL (USA)). May 1987. Contract AC02-76CH03000. 4p. (CONF-870552—27). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000734.

From 5. conference on real-time computer applications in nuclear, particle, and plasma physics; San Francisco, CA, USA (11 May 1987).

The ever increasing demand for more CPU cycles for data analysis on our Central VAX Cluster led us to investigate new ways to utilize more fully the resources that were available. A review of the experiment and software development VAX systems on site revealed many unused computing cycles. Furthermore, these systems were all connected by DECnet which would allow easy file transfer and remote batch job submission. A product was developed to allow jobs to be submitted on the Central VAX Cluster but actually to be run on one of the remote systems. The processing of the jobs was arranged, to the greatest extent possible, to be transparent to the user and to have minimal impact on both the Central VAX Cluster and remote systems.

51004 **(INIS-BR—736) Simulation in computerized tomography for cylindrical geometry objects.** Rogers, J.D.; Lopes, R.T.; Santos, C.A.C. (Sociedade Brasileira de Matematica Aplicada e Computacional, Rio de Janeiro). 1984. 2p. (In Portuguese). (CONF-8409402—2-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703488.

From 7. national congress on applied and computational mathematics; Campinas, SP, Brazil (24 Sep 1984).

Published in summary form only.

51005 (INIS-BR—838, pp 76) **PIAPICO-An interactive computer program for adjusting peaks in PC 2001 and compatibles.** Ribas, R.V. (Sao Paulo Univ., Brazil. Inst. de Fisica). 1986. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. File Number DE87703734. (CONF-8608195—Pt.2).

From 9. workshop on nuclear physics; Caxambu, Brazil (30 Aug 1986).

51006 (JAERI-M—86-178, pp 101-114) **Thermal-hydraulics of high conversion boiling water reactor.** Tsunoyama, Shigeaki. (Nippon Atomic Industry Group Co. Ltd., Tokyo). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

High Conversion Reactor is a concept of improving uranium utilization by reducing a moderator/fuel (H/HM) ratio with a tight lattice. High Conversion Boiling Water Reactor (HCBWR) could be designed with "a less-tight lattice" since the vapor in the core has an effect of reducing the H/HM ratio. A boiling transition in BWR is primarily due to a dryout of the liquid film on the heated surface. In HCBWR with "the less-tight lattice", the similar phenomena will cause the boiling transition. The KfK critical heat flux (CHF) correlation which correlates mainly the tight lattice data for PWR pressure conditions is appeared to give conservative results under BWR conditions. Using the Bettis Atomic Power Laboratory data, we developed the critical quality-boiling length type correlation for tight lattice, which is an integral scheme appropriate to evaluate BWR operating conditions. Further, the HCBWR concept was evaluated by analyzing thermal characteristics and plant dynamics of HCBWR.

51007 (JAERI-M—86-178, pp 192-200) **Problems in software development for nuclear robotics.** Shinohara, Yoshikuni. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

Major technical problems in developing softwares for intelligent robots for future nuclear applications are explained briefly. In order that a robot can perform various kinds of complex works, it must be equipped with a high level of artificial intelligence which includes sensing functions such as visiual, auditory, tactile, proximity sensing, cognitive functions such as recognition of objects and understanding of working environment, decision-making functions such as work planning and control functions such as manipulator and locomotion controls. A large amount of various kinds of signals and informations must be processed with a high speed for an integrated control of these functions. It will be desirable that the computer program for controlling a robot which must run in a real-time will have a functionally hierarchical and distributed structure from the view point of software development. Parallel processing will be required from the view point of computation time.

51008 (JAERI-M—86-178, pp 201-219) **Application of knowledge engineering to nuclear engineering.** Kobayashi, Yasuhiro; Kiguchi, Takashi; Kinoshita, Mitsuo; Tanji, Junichi; Mitsuta, Tooru; Wada, Hiroshi; Motoda, Hiroshi; Fukunishi, Hiroari; Yoshinaga, Toshiaki. (Hitachi Ltd., Ibaraki, Japan. Energy Research Lab.). Dec 1986. (In Japanese). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167. (CONF-8609319—).

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

This paper introduces two case studies on the application of the knowledge engineering to nuclear engineering ; the diagnosis and guidance in nuclear reactor control and operation, and the computer-aided pipe route planning in nuclear plant design. In the former study, a knowledge-based approach to the control and operation of dynamical systems has been developed with emphases on the fusion between the numerical computation for predicting the behavior of dynamical systems and the symbolic computation for inference, and the improvement in the inference efficiency with structured knowledge representation. The proposed approach is applied to a nuclear power plant and evaluated through the simulation tests. It is confirmed from the result that the function realized by this approach is useful in the diagnosis and guidance. In the latter study, a knowledge-based optimum design approach has been developed by coupling the inference process for deducing the design specification of a plant pipe route to be satisfied from experts' knowledge of design criteria and know-how and the optimi-

zation process for antomatically determining the pipe route satisfing the obtained specification. This approach is tentatively applied to the turbine building section of a nuclear power plant and the result suggests that this approach is viable for the improvement in design efficiency and quality.

51009 **(JAERI-M—86-178) Proceedings of the third seminar on software development in nuclear energy research.** Takano, Hideki; Fujii, Minoru (eds.). (Japan Atomic Energy Research Inst., Tokyo). Dec 1986. vp. (In Japanese). (CONF-8609319—). NTIS (US Sales Only), PC A12/MF A01. File Number DE87780167.

From 3. seminar on software development in nuclear energy research; Tokai, Japan (10 Sep 1986).

Separate abstracts were prepared for the individual papers in this report. (JDB)

51010 **(LA-UR—87-1497-Final) The MEGA data acquisition system.** Oothoudt, M.A.; Amann, J.F.; Bolton, R.D.; Hughes, E.B.; Jui, C.C.H.; Cooper, P.S.; Hahn, K.; Lauer, R.B.; Markey, J.K. (Los Alamos National Lab., NM (USA); Stanford Univ., CA (USA). High-Energy Physics Lab.; Yale Univ., New Haven, CT (USA). Dept. of Physics). 1987. Contract W-7405-ENG-36. 6p. (CONF-870552—26). NTIS, PC A02. File Number DE88000520.

From 5. conference on real-time computer applications in nuclear, particle, and plasma physics; San Francisco, CA, USA (11 May 1987).

The MEGA experiment will acquire 3 MB/sec of data into a 9-crate Fastbus system controlled by a single Fastbus master. A second-level trigger will be implemented in a Fermilab Advanced Computer Program (ACP) farm of 32 Motorola 68020 microprocessors. Output from the ACP farm at a rate of 24 KB/sec will be sent to a MicroVAX II for taping. 16 refs.

51011 **(LA-UR—87-2543) Computer based terrain analysis for operational planning.** Powell, D.R. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 13p. (CONF-8710124—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE87013172.

From Conference on systems, man, and cybernetics; Alexandria, VA, USA (20 Oct 1987).

Analysis of operational capability is an ongoing task for military commanders. In peacetime, most analysis is conducted via computer based combat simulations, where selected force structures engage in simulated combat to gain insight into specific scenarios. The command and control (C^2) mechanisms that direct combat forces are often neglected relative to the fidelity of representation of mechanical and physical entities. C^2 capabilities should include the ability to plan a mission, monitor execution activities, and redirect combat power when appropriate. This paper discusses the development of a computer based approach to mission planning for land warfare. The aspect emphasized is the computation and representation of relevant terrain features in the context of operational planning.

51012 **(LA-UR—87-2958) A general topology, Godunov method.** Addessio, F.; Cline, M.; Dukowicz, J. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 22p. (CONF-8704168—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE88000511.

From Workshop on particle methods in fluid dynamics and plasma physics; Los Alamos, NM, USA (13 Apr 1987).

A numerical technique that utilizes a general topology mesh is described. The method employs the arbitrary Lagrangian-Eulerian procedure and explicit, finite-volume, Godunov numerics. Material interfaces are resolved to eliminate fictitious mixing and nonphysical shear impedance. Cell-centered variables, including velocity, are used to provide consistent control volumes for the advection of mass, momentum, and energy, and to allow arbitrary slip between material regions. The computational mesh is composed of arbitrary polygonal cells. The constraint of a fixed logical connectivity for the mesh is removed. Consequently, geometrical mesh limitations, which are responsible for inaccuracies and code failure during the evolution of region boundaries, are absent. Arbitrary boundaries can be resolved, and the mesh is capable of changing smoothly and rapidly from regions of high to low resolution. Lack of a coherent mesh orientation minimizes numerical anisotropy. A mesh rezoning approach, based on a dual triangulation and coupled with a global remapping algorithm, allows the mesh to evolve dynamically. 9 refs., 6 figs.

51013 **(NBI-HE—86-41) Random map model: A disordered model with deterministic dynamics.** Derrida, B.; Flyvbjerg, H. (Niels Bohr Inst., Copenhagen (Denmark); California Univ., Santa Barbara (USA). Inst. for Theoretical Physics). Nov 1986. 28p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87752900.

The random map model is a simple disordered system with deterministic dynamics. For each point in phase space, one chooses at random another point in phase space as being its successor in time. Phase space is broken into basins of several attractors. We obtain the analytic expression for the probability distribution f(W/sub s/) of the weights W/sub s/, where W/sub s/ denotes the normalized size of the basin of the s/sup th/ attractor. We also compute the probability distribution PI(Y) of Y where Y is defined by Y = Σ/sub s/ W/sub s//sup 2/. When we compare f(W) and PI(Y) in the random map model and in the mean field theory of spin glasses, we find that the shapes are very similar in both models but the analytic expressions are different.

51014 **(NBI-HE—86-45) Random paths with curvature dependent action.** Ambjoern, J.; Durhuus, B.; Jonsson, T. (Niels Bohr Inst., Copenhagen (Denmark); Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). Nov 1986. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752897.

We study discretized random paths with a curvature dependent action. The scaling limits of the corresponding statistical mechanical models can be constructed explicitly and are either usual Brownian motion or a theory where the correlations of tangents are nonzero and described by diffusion on the unit sphere. In the latter case the two point function has an anomalous dimension eta = 1.

51015 **(NBI-HE—86-52) Random complex automata: Analogy with spin glasses.** Flyvbjerg, H. (Niels Bohr Inst., Copenhagen (Denmark)). Dec 1986. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87752899.

Ab initio properties of random networks of automata have been studied statistically. A strikingly high degree of similarity is demonstrated between the multivalley structure of the basins of attraction of Kauffman's model and that of infinite range spin glasses. Results from simulations as well as exact analytical results are presented.

51016 **(NBI-HE—87-06) Statistical properties of randomly broken objects and of multivalley structures in disordered systems.** Derrida, B.; Flyvbjerg, H. (Niels Bohr Inst., Copenhagen (Denmark); CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique). Feb 1987. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87752896.

The statistical properties of the multivalley structure of disordered systems and of randomly broken objects have lots of features in common. For all these problems, if W/sub s/ denotes the weight of the s/sup th/ piece, we show that the probability distributions P/sub 1/(W/sub 1/) of the largest piece W/sub 1/, P/sub 2/(W/sub 2/) of the second largest piece, and PI(Y) of Y = Σ/sub s/ W/sub s//sup 2/ have always singularities at W/sub 1/ = 1/n, W/sub 2/ = 1/n and Y = 1/n, n = 1, 2, 3,...

51017 **(ORNL/TM—10410) A portable hypercube simulator.** Dunigan, T.H. (Oak Ridge National Lab., TN (USA)). Jul 1987. Contract AC05-84OR21400. 26p. NTIS, PC A03. File Number DE87013369.

The structure and use of a hypercube simulator that runs on most UNIX systems is described. The simulator uses a library of message-passing routines and multiple user processes, written in either C or FORTRAN, to provide an environment for the development and testing of algorithms for hypercube parallel processors. The simulator produces a trace file that can be used for debugging, performance analysis, or graphical display. A version of the simula-

tor that uses the shared memory of a Sequent multiprocessor is also described.

51018 **(PNL—6274) Interface and installation guide: SAFT-UT utilities.** Hall, T.E. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1987. Contract AC06-76RL01830. 27p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000546.

This document is one in a set of three reference documents pertaining to the SAFT-UT Utilities. The GUIDE TO SAFT-UT PRINCIPLES AND CONVENTIONS provides the user with an overall background for practical implementation of SAFT-UT and the associated software utilities. The REFERENCE MANUAL describes in detail each utility available to the user. This document, the INTERFACE AND INSTALLATION GUIDE, describes the steps necessary to install the SAFT utilities and Real-Time Processor on a VAX class computer running the VMS operating system. It also describes in detail the method for adaptation of user data files and the user's data collection system to the SAFT-UT Utility set.

51019 **(PNL—6276) SAFT-UT utilities: Reference manual.** Hall, T.E. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1987. Contract AC06-76RL01830. 64p. NTIS, PC A04/MF A01; GPO Dep. File Number DE88000547.

This manual is intended to give the user a complete command and operation reference for using the SAFT-UT utilities in the VMS environment. It augments two additional documents, the Guide to SAFT-UT Principles and Conventions and the Interface and Installation Guide. An understanding of the contents of the Guide to SAFT-UT Principles and Conventions is a recommended prerequisite to the use of the SAFT-UT utility programs.

51020 **(SAND—86-2480C) A stiff ODE [ordinary differential equation] solver for use in solving two-dimensional reaction-diffusion problems.** Salane, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 6p. (CONF-870860—2). NTIS, PC A02. File Number DE88000394.

From 6. international conference on mathematical modelling; Saint Louis, MO, USA (4 Aug 1987).

A special procedure for solving block tridiagonal systems has been added to a stiff differential equation solver. The modified solver is particularly suited for use in solving two-dimensional reaction-diffusion problems.

51021 **(SAND—87-0454C) A data analysis environment for HP [Hewlett-Packard] 1000 computers.** Drotning, W.D. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 10p. (CONF-8710149—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87010511.

From Interex - HP 1000 and HP 9000 user's technical conference; San Jose, CA, USA (18 Oct 1987).

An examination of data analysis programs used on our Hewlett-Packard [2] 1000 system showed that many programs used a large fraction of code and programming effort to accomplish common tasks, such as file access and creation, data retrieval and storage, and the like. A clear need existed for a comprehensive, well-structured environment which would consolidate many previously-separated functions in a consistent, robust, easy-to-use format. Program DATA was written to accomplish a wide variety of tasks related to analysis of data stored in File Manager files on Hewlett-Packard HP 1000 minicomputer systems. As a data analysis tool, DATA provides a number of mathematical analysis and data manipulation functions. Flexible file structures, on both input and output, are allowed. An editor is included which allows DATA to serve as a binary file editor for data; search routines based on numeric, rather than string, values are incorporated. Also included are graphical plotting of data and functions, cursor selection of specific data regions, and other graphics features. DATA also serves as a shell operating system, with direct interface to the RTE operating system. Commonly-used file management functions are incorporated or enhanced for operator convenience. DATA is both command- and softkey-driven, with on-line help facilities and extensive error-checking. Finally, DATA serves as a common framework for future expansion with additional libraries or user-defined functions. 4 refs.

51022 **(SAND—87-1775C) Structure and operation of the ITS code system.** Halbleib, J.A. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 23p. (CONF-8709115—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87013064.

From International school of radiation damage and protection; Sicily, Italy (24 Sep 1987).

ITS is a powerful and user-friendly software package permitting state-of-the-art Monte Carlo solution of linear time-integrated coupled electron/photon radiation transport problems, with or without the presence of macroscopic electric and magnetic fields of arbitrary spatial dependence. Our goal has been to simultaneously maximize operational simplicity and physical accuracy. Through a machine portable utility that emulates the basic features of the CDC UPDATE processor, the user selects one of eight codes for running on a machine of one of four (at least) major vendors. The ease with which this utility is applied combines with an input scheme based on order-independent descriptive keywords that makes maximum use of defaults and internal error checking to provide experimentalists and theorists alike with a method for the routine but rigorous solution of sophisticated radiation transport problems. Physical rigor is maximized by employing the best available cross sections and sampling distributions, and the most complete physical model for describing the production and transport of the electron/photon cascade from 1.0 GeV down to 1.0 keV. Flexibility of construction permits the more sophisticated user to tailor the codes to specific applications and to extend the capabilities of the codes to more complex applications through simple update procedures. 35 refs.

51023 **(UCRL—53746) Realism in computer-generated images.** Laguna, G.W.; Kalibjian, J.R. (Lawrence Livermore National Lab., CA (USA)). Sep 1985. Contract W-7405-ENG-48. 54p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000677.

This work outlines the history of shading methods in computer graphics, brings together key concepts from color science and optics, and presents a method (based on that popularized by Cook and Torrance) for generating realistically shaded images. The authors discuss each parameter used in the model and show how the model is used in practice. 17 refs.

51024 **(UCRL—96632) PROVER: A first-order logic system in Ada.** Burback, R. (Lawrence Livermore National Lab., CA (USA)). Sep 1987. Contract W-7405-ENG-48. 26p. (CONF-8710163—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000220.

From 3. annual conference on artificial intelligence and Ada; Fairfax, VA, USA (14 Oct 1987).

PROVER is a complete first-order-predicate logic system written in Ada. The system takes advantage of Ada strong typing to improve the run time performance of the unification algorithm. In addition, two new techniques of unification indexes and goal directed deductions are introduced and implemented. PROVER is based on the logic tableau method of Manna and Waldinger. A generalized resolution method combined with a polarity strategy is used to compute the goal-directed first-order logic deductions. The heart of the system is a most general unifier with support for variable renaming, string substitution, and complex list structures. Universal and existential skolemization is based on the force of quantifier method. Rules for true-false simplification, negation, splitting, and rewrites are supported. This paper describes the algorithms used in PROVER as well as implementation details of the Ada code.

51025 **Properties of properly embedded minimal surfaces of finite topology.** Hoffman, D.; Meeks W.H. III. (Florida State University, Chemistry Department, Tallahassee,, Florida 32306). *Bulletin of the American Mathematical Society;* 17: No. 2, 296-300(Oct 1987).

Eight theorems relating to embedded minimal surfaces are presented. (AIP)

51026 Topology and geometry of embedded surfaces of constant mean curvature. Meeks W.H. III. (Florida State University, Chemistry Department, Tallahassee,, Florida 32306). *Bulletin of the American Mathematical Society;* **17**: No. 2, 315-317(Oct 1987).

Five global theorems are given concerning properly embedded surfaces. (AIP)

51027 Line (block) size choice for CPU cache memories. Smith. (Dept. of Electrical Engineering and Computer Sciences, Computer Science Div., Univ. of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Computers;* **C-36**: No. 9, 1063-1075(Sep 1987).

The line (block) size of a cache memory is one of the parameters that most strongly affects cache performance. In this paper, the author studies the factors that relate to the selection of a cache line size. The primary focus is on the cache miss ratio, but they also consider influences such as logic complexity, address tags, line crossers, I/O overruns, etc. The behavior of the cache miss ratio as a function of line size is examined carefully through the use of trace driven simulation, using 27 traces from five different machine architectures. The change in cache miss ratio as the line size varies is found to be relatively stable across workloads, and tables of this function are presented for instruction caches, data caches, and unified caches. An empirical mathematical fit is obtained. This function is used to extend previously published design target miss ratios to cover line sizes from 4 to 128 bytes and cache sizes from 32 bytes to 32K bytes; design target miss ratios are to be used to guide new machine designs. Mean delays per memory reference and memory (bus) traffic rates are computed as a function of line and cache size, and memory access time parameters. They find that for high performance microprocessor designs, line sizes in the range 16-64 bytes seem best; shorter line sizes yield high delays due to memory latency, although they reduce memory traffic somewhat. Longer line sizes are suitable for mainframes because of the higher bandwidth to main memory.

51028 Experimental parallel computing architectures. Dongarra, J.J. New York, NY; Elsevier Science Pub. Co. Inc. (1987). 304p. Elsevier Science Pub. Co. Inc., 52 Vanderbilt Ave., New York, NY 10017.

Describing a few of the many research directions being taken to investigate potential parallel-computer designs, this book enables the researcher to keep pace with rapid advances in the development of computer architectures directed towards parallel processing and high execution rates. It discusses projects being conducted at universities, national laboratories and in industry, guided by the applications at those sites and the scientific expertise located there. The projects are not limited to developing a prototype computer; they are building new hardware concepts, and switching networks and developing new algorithms for parallel computing.

51029 A vehicle identification system for surveillance applications. Bukaty, M.E. (Sandia National Labs., Albuquerque, NM 87185). pp 106-111 of Topical meeting on machine vision (summaries). Washington, DC; Optical Society of America (1987). (CONF-870357—).

From 2. topical meeting on machine vision; Lake Tahoe, NV, USA (18 Mar 1987).

Many surveillance applications require electronic images to provide real time or near real time pictures. An example might involve the security system of a sensitive facility where the monitoring of entering and exiting traffic is important. Since the objects of interest in this scenario are vehicles, it is possible to use a one-dimensional line scanner and let the vehicle self scan via its motion. The resulting image is two-dimensional with the vertical representing a spatial displacement and the horizontal time.

9903 Information Handling

REFER ALSO TO CITATION(S) 49689, 50067, 50513, 51009

51030 (DOE/MI/10075—T1) The Black College satellite telecommunications network planning in support of energy-related collaborative research: Final report. (Howard Univ., Washington, DC (USA). Office of Satellite Communications). Oct 1986. Contract FG01-85MI10075. 28p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE88000182.

Four interrelated phases constituted this 12-month effort: planning, system test, system shakedown and system implementation. Objective was to determine and test the most feasible satellite telecommunications network configuration in support of HBCU (historically black college/university) principal investigators conducting research in the energy sciences. This report outlines the accomplishments of that planning effort, indicates potential uses of the operational network and specifies resources needed to effectively mobilize widespread use of the system by HBCU scientists.

51031 (DP-MS—87-103) Electronic Records Administration at the Savannah River Plant. Hudson, B.J. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). 1987. Contract AC09-76SR00001. 14p. (CONF-8710132—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87014842.

From Department of Energy automated office support system conference; Denver, CO, USA (7 Oct 1987).

The Savannah River Plant (SRP), which is operated by DuPont for the Department of Energy (DOE), is faced with the problem of providing ready access to information. A sitewide information network has been installed implementing electronic mail (ALL-IN-1) and various other office automation features. However, users need access to information contained in manuals, earlier research reports, and technical publications located in the central files. Planning is underway to procure a document and information storage and retrieval system linked to the sitewide information network. The system should provide retrieval of image scans of any document via full text and keyword searching of current and archived documents. Old documents will be input to the system through a high-speed image scanning system and optical disk storage. Optical character recognition (OCR) will be performed on these images and the resulting text stored in a document search and retrieval system. A user will utilize the search system to identify the documents needed, and retrieve either the text only from the search system or the image scan from the optical storage system.

51032 (EPRI-EL—5242) Integration of utility communication systems: Workshop proceedings. Blair, W.E.; Grimsrud, P.; Cleveland, F.; Robinson, J. (Energy and Control Consultants, San Jose, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 1987. 185p. (CONF-8612105—). Research Reports Center, Box 50490, Palo Alto, CA . File Number TI87920583.

From Workshop on integration of utility communication systems; Houston, TX, USA (2 Dec 1986).

These proceedings present the results of a workshop on integration of utility communication systems. The purpose of the workshop was to identify utility requirements for communication interfaces between four sectors of a typical utility: distribution, transmission, power plants, and control centers. The technical presentations in this book were designed to present a broad spectrum of utility and vendor experience and perspectives. Workshop participants identified and prioritized five general EPRI research and development topics, which are listed below: Communication Network Architecture, Investigate and develop an OSI-based utility architecture to facilitate integration of data communications within and between utilities; Data Bases, Investigate and develop guidelines to integrate data bases within a utility; Communications Network Analysis, Evaluate existing and/or develop new analytical tools and models for communication network planning and operations; Protocol Demonstration, Test and evaluate new protocols and standards for integration of communication and computer systems on host utilities; and Expert Systems, Investigate and develop expert sys-

tems for aiding planners, engineers and operators to evaluate and control utility communication and computer systems.

51033 (IAEA-TECDOC—419, pp 23-26) **INIS - a general introduction.** Schiele, J. (International Atomic Energy Agency, Vienna, Austria. INIS Section). May 1987. NTIS (US Sales Only), PC A08/MF A01. File Number DE88700115. (CONF-8603158—).

From IAEA expert meeting on spent fuel management; Vienna, Austria (10 Mar 1986).

The paper presents the general introduction to the International Nuclear Information System operated by the IAEA in collaboration with the Member States and cooperating international organizations. At present there are 74 Member States of the IAEA and 14 international organizations participating in INIS. The purpose of INIS is to provide a comprehensive nuclear information announcement and abstracting service in every aspect of the peaceful uses of nuclear science and technology and related fields. Updating of the database is done twice a month with an average volume of 3,000 documents, resulting in an annual increase of between 70,000 and 80,000 document references. In April 1986 the one millionth document reference will be reported to the system.

51034 (INIS-mf—10958, pp 86-96) **Information sources for the operation and maintenance of nuclear power plants.** Ferrova, A. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

It is stated that one of the most important information sources for personnel working in the operation and maintenance of nuclear power plants are conferences and symposia. This is why the Nuclear Information Centre approaches the establishment of a factual information system on conferences and symposia (FISKS) with output in form of processed reports from conferences classified according to the original conference proceedings. The FISKS system is part of the system of scientific, technical and economic information for the Czechoslovak nuclear programme and a subsystem of the factual data system of the NIC. The aim of the system is to rapidly disseminate highly topical and valuable information presented at conferences and symposia, especially abroad. The factographic processing of such information in the native language will make the information a welcome contribution to the decision-making process at all levels of the Czechoslovak nuclear power programme, from top administration to departments at nuclear power plants. Briefly described are information systems for the collection of reliability data (SRDF) of French nuclear power plants with PWR reactors, and the maintenance control computer program (MMCP) developed by Westinghouse for nuclear and fossil-fuel power plants. (Z.M.).

51035 (INIS-mf—10958, pp 111-117) **CLASS system and the scheduling problem.** Zarnovican, V. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The need to process large quantities of data on the machine equipment of nuclear power plants and the high level of occurrence of recurrent technological procedures applied in maintenance will create the preconditions for the introduction of automated processing of this data and the subsequent automated control of units of centralized maintenance in nuclear power plants. For the said purposes the Research Institute for Nuclear Power Plants at Jaslovske Bohunice has selected activities suitable for automated processing and has experimentally applied to these activities the CLASS decision-making system operating with the CPM method. It is stated that the automated system for the operative control of repairs of nuclear power plants requires detailed information on conditions from which ensue the inter-relations between repairs. The choice of the most suitable sequence of operations should be left to the program which uses elements of artificial intelligence. Some aspects are discussed of the mathematical model of such a decision-making system in CLASS-AI operative control. (Z.M.).

51036 (INIS-mf—10958, pp 123-129) **Use of the Power Reactor Information System on nuclear power plant outages.** Kremnican, M.; Skvarka, P. (Vyskumny Ustav Palivoenergetickeho Komplexu, Bratislava, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

PRIS, the data bank on operating characteristics of nuclear reactors is described (Power Reactor Information System), operated by the IAEA. The possibility is discussed of using PRIS data for the evaluation of the trend of failure rate of nuclear power plants in the world with the aim of improving the availability of Czechoslovak nuclear power plants. Some results are presented of analyses made for this purpose. Attention has been devoted to the contribution of outages of main components to the total outages of nuclear power plants, the development of outages in relation to the time elapsed from the commissioning of the plant, and the classification of outages by the length of their duration. (Z.M.).

51037 (INIS-mf—10958, pp 130-134) **Requirements on automated acquisition of data on nuclear power plant maintenance with a view to evaluating outages of electric power generation facilities.** Popovicova, A. (Vyskumny Ustav Energeticky, Bratislava, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

A mathematical model is described of the development of the electrification system with regard to the unavailability of power production installations. The model serves short-term predictions of the development of the electrification system in the individual years of a five to ten year period, as well as medium-and long-term forecasts for periods of 15 to 20 years. The differences are discussed in input data for short-term, medium-term and long-term forecasts. Special attention is devoted to acquisition of the input data, their structure and method of storage. In this respect the conclusion is arrived at that information should be stored in basic form, the operator of every file must also store such information which he does not need for immediate operation, and that the benefit of information feedback from the automated system should exceed the costs of its construction and operation. (Z.M.).

51038 (INIS-mf—10958, pp 148-158) **Testing the upgraded reliability information system of the Bohunice nuclear power plant.** Kubanyi, J.; Mikus, M. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Improved reliability system SIS for Czechoslovak nuclear power plants was tested at Jaslovske Bohunice. The SIS information system serves the maximum use of data on the operation of nuclear power plants, by manufacturers of individual components, as well as the rational collection and evaluation of data by operators of nuclear power plants, superior bodies, project design organizations, etc. As concerns data collection there are three methods: the direct recording of information using technical means which is optimal but only applicable to some types of data, such as are measurable variables. Interactive data inputting via a terminal is the best solution for most data but at the Jaslovske Bohunice nuclear power plant this method could not be used because the plant does not have the required terminal network. A third method was therefore chosen, namely the manual completing of forms with subsequent processing of the thus collected data into formats suitable for computerization. The shortcomings of such a method are pointed out, mainly the fact that the possibility is lost of immeditely checking input data which in case of the direct computer input via a terminal is provided by the respective SIS software. (Z.M.).

51039 (INIS-mf—10958, pp 159-165) **Upgrading the reliability information system of nuclear power plants in Czechoslovakia.** Dubrovcak, P. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice, Czechoslovakia). 1986. (In Slovak). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Reliability information system SIS is described operated in Czechoslovak nuclear power plants for the collection, recording and evaluation of data related to the reliability characteristics of individual power plant units. In its upgraded form, the SIS system uses 10 forms for data collection and recording on which are recorded data on defects and failures and maintenance of equipment, trial runs of safety systems, operation and idle time of reactors and turbogenerators, on operating load of components of the primary circuit, turbogenerators and components of the secondary circuit and on material characteristics of components of the primary and secondary circuits. These data are subsequently computerized either on punched cards or through terminals. Computer output printouts (50 have been designed) serve as basic documents for the needs of the power plant, superior bodies, project design bodies, production enterprises for individual components and for other institutions, including the IAEA. (Z.M.).

51040 (INIS-mf—10958, pp 166-174) **Preparation of a central system of material and technical provision as a prerequisite of automated control in the field of nuclear power plant production and maintenance.** Nohac, K. (Ceske Energeticke Zavody, Prague, Czechoslovakia). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

The subsystem of material and techical provision should be designed within the establishment of an automated system of nuclear power plant control, this in close interlinkage with the subsystems of power plant production and maintenance. Production and maintenance are responsible for the major part of material consumption. Briefly discussed are specific demands placed by material and technical provision in nuclear power plants on the control system, and some problems are taken up related to the modelling of this system. Attention is also focused on providing an adequate information system which should be set up hand in hand with the development of the plant's control system and which must fully meet the information needs of the control system which is being established. Such procedure was adopted for the preparation of the automated system of material and technical provision which is always related to a certain activity of material and technical provision (planning, orders, contracts, etc.) in all cyclically recurrent stages (methodology, implementation, record-keeping, analyses). In the first stage of the preparation of an automated system of control of material and technical provision for nuclear power plants the very complex activity of "stores standardization" was dealt with. (Z.M.).

51041 (INIS-mf—10958, pp 80-85) **Use of automated systems in nuclear power generation.** Suk, B. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). 1986. (In Czech). NTIS (US Sales Only), PC A12/MF A01. File Number DE87703555. (CONF-8604348—).

From Conference on automated systems of nuclear power plant control; Tale, Czechoslovakia (15 Apr 1986).

Briefly described are the activities of the Nuclear Information Centre as the Czechoslovak centre for the use of INIS output materials in the field of nuclear power. Apart from INIS the centre serves the needs of personnel working in the Czechoslovak nuclear power industry by providing other IAEA information materials, such as the Operating experience with nuclear power stations in member states and the Incident reporting system. The NIC is also building its own automated factual data base - the FIS-EJE which will collect and distribute data on costs of the construction and operation of nuclear power plants in various parts of the world as well as other related data. The source of data for FIS-EJE will be published literature and outputs of the Energy and Economic Databank operated within the IAEA. The planned annual acquisition of FIS-EJE is 300 items. Off-line computer processing of the data base is suggested on an external computer. (Z.M.).

51042 (LBL-PUB—3067) **User's guide for the ICS [Integrated Communications System] database system: Version 1.1.** Konrad, A. (Lawrence Berkeley Lab., CA (USA)). Aug 1987. Contract AC03-76SF00098. 74p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE88000212.

The ICS database was implemented in support of the Integrated Communications System (ICS) Project. Additionally, it is linked to the LBLSTAFF database using the OCTOPUS, ICS, and SERVICE subfiles so that staff need not maintain employee information such as mailstop, payroll account number, termination date, etc. This relieves the staff of tracking mailstop changes and other personal information.

51043 (UCRL—96911) **Towards automated consulting: Design feedback from the performance of online documentation.** Girill, T.R.; Luk, C.H.; Norton, S. (Lawrence Livermore National Lab., CA (USA)). Jul 1987. Contract W-7405-ENG-48. 8p. (CONF-8610336—1). NTIS, PC A03. File Number DE87012243.

From 50. annual meeting of the American Society for Information Science; Boston, MA, USA (4 Oct 1986).

Usage monitoring of online documentation at a supercomputer center strongly suggests the importance of three strategies in the design of an effective "consulting" system to deliver full-text answer passages to end users: (1) persistent on-demand printing as well as online viewing make a shared database economically vital; (2) a broad range of subject queries makes retrieval on diverse topics through a single user interface psychologically beneficial to readers, and (3) vocabulary mismatch errors demand an active response to faulty search terms, but not at the cost of increased interface complexity.

9904 Law

REFER ALSO TO CITATION(S) 51032

51044 (IAEA-INFCIRC—9-Rev.2-Add.6) **Agreement on the privileges and immunities of the Agency. Acceptances by Member States.** (International Atomic Energy Agency, Vienna (Austria)). May 1987. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87703408.

Hard copies are available in various languages from IAEA Division of Publications, Distribution Unit.

The document contains the list of Member States which, by 1 May 1987 had accepted the Agreement on the Privileges and Immunities of the International Atomic Energy Agency. The list is followed by the texts of reservations to the Agreement made by some of the Members in question when depositing their respective instruments of acceptance with the Director General.

51045 (IAEA-INFCIRC—335-Add.1) **Convention on early notification of a nuclear accident. Convention on assistance in the case of a nuclear accident or radiological emergency.** (International Atomic Energy Agency, Vienna (Austria)). May 1987. 13p. (IAEA-INFCIRC—336-Add.2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87703409.

The document refers to the Convention on early notification of a nuclear accident (INFCIRC-335) and to the Convention on assistance in the case of a nuclear accident or radiological emergency (INFCIRC-336). Part I of the document contains the texts of reservations/declarations made by some of the countries upon or following signature. Part II contains the texts of reservations/declarations made upon or following deposit of instrument, expressing consent to be bound.

51046 (INIS-mf—10683) **Law and technology. Legal regulations for installations, equipment and materials in the German and European law systems. Lectures and discussions.** Lukes, R. (comp.). (Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.)). 1984. 237p. (In German). (CONF-8411304—). NTIS (US Sales Only), PC A11/MF A01. File Number DE87752883.

From Symposium on law and technology - legal regulations for installations, equipment and materials in the German and European law systems; Muenchen, F.R. Germany (22 Nov 1984).

BMWI Studien-Reihe.; No. 53.

The book presents the lectures and discussions of a symposium held in November 1984. The main themes of the lectures deal with the legal regulations for technological subjects, and their effects on the economy and society. Some papers discuss the legal provisions of this kind within the German law system, summarizing the regulations in force, and critically evaluating their efficiency. Others investigate the potentials and constraints of efforts towards harmonizing the variety of indefinite legal terms or concepts in the legal regulations of technological safety, and the problems created by such indefinite legal concepts with regard to constitutional law and legislation, or application of the law. Another main subject is the question of how technical safety regulations can be made more concrete, or the European law and its relevant regulations concerning technological subjects. Separate subject analyses of four papers have been made for the database. (HSCH).

51047 (INIS-mf—10683, pp 14-25) **Legal provisions governing technical installations, especially regulations of the Building Law, Trade-and-Industry Law, and Atomic Energy Law.** Nicklisch, F. (Heidelberg Univ., Germany, F.R. Forschungsgruppe Technologie und Recht). 1984. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87752883. (CONF-8411304—).

From Symposium on law and technology - legal regulations for installations, equipment and materials in the German and European law systems; Muenchen, F.R. Germany (22 Nov 1984).

BMWI Studien-Reihe.; No. 53.

The author first shows the various legal regulation patterns of the German law system with regard to technical installations and in this context discusses the comprehensive clause method which refers to scientific-technical standards. This method is said to be an adequate means of achieving suitable results in the relationship between law and technology. However, three weak points can be seen: (1) The law system uses many different standards. (2) Due to uncertainty about the real meaning and content of these standards, it is not clear how these standards are defined. (3) This in practice puts up the question to what extent statutory works of technology are a suitable tool of making legal regulations more concrete, and whether they are to be given binding force. (HSCH).

51048 (INIS-mf—10683, pp 60-75) **Potentials and constraints of efforts towards harmonizing various indefinite legal terms or concepts of legal regulations of technological safety.** Lukes, R. (Muenster Univ., Germany, F.R. Forschungsstelle Recht und Technik). 1984. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87752883. (CONF-8411304—).

From Symposium on law and technology - legal regulations for installations, equipment and materials in the German and European law systems; Muenchen, F.R. Germany (22 Nov 1984).

BMWI Studien-Reihe.; No. 53.

The author defines indefinite legal terms or concepts to be those through which - second in priority after the legally defined and special official requirements - quality and performance standards are incorporated in the legal regulations which in a given subject field and according to the general attitude are common, acknowledged and proven standards. Only this approach will justify any efforts towards reducing and harmonizing such concepts. These efforts must include unambigious definitions of mode of application, and a system of concrete definition of requirements in accordance with the general attitude. (HSCH).

51049 (INIS-mf—10683, pp 101-122) **Indefinite legal concepts - problems encountered in legislation and application of the law.** Erichsen, H.U. (Muenster Univ., Germany, F.R. Kommunalwissenschaftliches Inst.). 1984. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87752883. (CONF-8411304—).

From Symposium on law and technology - legal regulations for installations, equipment and materials in the German and European law systems; Muenchen, F.R. Germany (22 Nov 1984).

BMWI Studien-Reihe.; No. 53.

The paper presents a survey of the problems encountered when applying indefinite legal terms or concepts. The main topic pursued by the author is the responsibility of the legislator with regard to the decisions to be taken exclusively by the government, i.e. the question whether and to what extent the legislator should be allowed to use indefinite legal terms or concepts. In this context, aspects such as the margin of assessment, ultimate decision competence, and parliamentary reservation. (HSCH).

51050 (INIS-mf—10683, pp 123-145) **Possibilities of a more concrete determination of indefinite legal terms and concepts in legal regulations concerning technological safety and material.** Scholz, R. 1984. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87752883. (CONF-8411304—).

From Symposium on law and technology - legal regulations for installations, equipment and materials in the German and European law systems; Muenchen, F.R. Germany (22 Nov 1984).

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The lecture discusses the indefinite legal concept and possibilities of a more concrete determination with a view to the legal and practical suitability and usefulness, for the purpose of handling technological standards of quality and performance within the legal system, and converting them appropriately into legal concepts compatible with the constitutional state. Indefinite legal concepts such as 'state of the art in technology' encompass margins of assessment and development which offer the administration prerogatives, which mean, that they are capable of being adjudicated only under certain conditions. A feasible solution, and a desirable one, would be to clarify the situation by a legislative measure, i.e. to apply the so-called principle of presumption, saying that technological assessments in compliance with the rules of technology as expressed by DIN (VDE, KTA) standards, are taken to be the state of the art in technology. (HSCH).

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Qualifier
Title, (supplementary information), citation number, (R;US)

The notations in the final parentheses indicate the type of document, e.g., R for Report; the country of publication, e.g., US; and the language if other than English, e.g., In German. Tables of document types and country of publication codes appear after the indexes.

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processes applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept (e.g., Pipeline Quality Gas, see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed. Copies of DOE/TIC-7000, the Subject Thesaurus, are available from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161.

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AC03-84SF11963	**GA Technologies, Inc., San Diego, CA (USA)**	
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AC04-76DP00053	**Miami Univ., Oxford, OH (USA). Dept. of Chemistry**	
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AC04-76DP00613	**Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.**	
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AC04-76DP00789	**Sandia National Labs., Albuquerque, NM (USA)**	
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AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
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AC04-79ET15397	**Science Applications International Corp., San Diego, CA (USA)**	
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AC04-86AL33183	**Integral Technologies, Inc., Westmont, IL (USA)**	
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AC05-84OT21400	**Geraghty and Miller, Inc., Oak Ridge, TN (USA)**	
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AC06-76FF02170	**Hanford Engineering Development Lab., Richland, WA (USA)**	
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AC06-77RL01030	**Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations**	
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AC07-84ID12435	**Westinghouse Idaho Nuclear Co., Inc., Idaho Falls (USA)**	
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AC11-76PN00014	**Bettis Atomic Power Lab., West Mifflin, PA (USA)**	
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AC21-85MC22045	**Institute of Gas Technology, Chicago, IL (USA)**	
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AI06-81RL10336	**Pacific Northwest Lab., Richland, WA (USA)**	
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AS05-77ER05489	**Georgia Inst. of Tech., Atlanta (USA). School of Physics**	
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AS05-85ER53193	**Texas Univ., Austin (USA). Inst. for Fusion Studies**	
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AS07-84ID12552	**Pennsylvania State Univ., University Park (USA)**	
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FC02-85CH10249	**Southern California Edison Co., Rosemead (USA)**	
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FG02-87ER60529	**State Univ. of New York, Buffalo (USA). Dept. of Biology**	
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	See KURRI-TR-281	DE87780168	MN -80	12:50002
CONF-8508243-	(Short-term conference on evaluation of effective dose equivalent for personal dosimetry, Kumatori, Osaka, Japan, 2 Aug 1985)			
	See KURRI-TR-283	DE87780169	MN -41	12:50709
CONF-8508247-	(7. short conference on neutron radiography, Kumatori, Japan, 20-21 Aug 1985)			
	See KURRI-TR-282	DE88700062	MN -80	12:49694
CONF-8509330-	(CERN accelerator school, Oxford, UK, 16-27 Sep 1985)			
Vol.1	*See* CERN-87-03-Vol.1	DE88700001	MN -32	12:50096
Vol.2	*See* CERN-87-03-Vol.2	DE88700002	MN -28	12:50097
CONF-8509338-	(Nuclear methods in mining, geology, geophysics and geochemistry, Marianska u Jachymova, Czechoslovakia, 23-27 Sep 1985)			
Absts.	*See* INIS-mf-10962	DE87703559	MN -4	12:50314
CONF-8509408-	(Consultants' group meeting on stable isotope reference samples for geochemical and hydrological investigations, Vienna, Austria, 16-18 Sep 1985)			
	See INIS-mf-10954	DE87703554	MN -4	12:49939
CONF-8509411-	(10. colloquium of the Brazilian Society of Electron Microscopy, Sao Paulo, Brazil, 1-6 Sep 1985)			
1-Summ.	*See* INIS-BR-821	DE87703718	MN -25	12:49871
2-Summ.	*See* INIS-BR-822	DE87703719	MN -23	12:50286
3-Summ.	*See* INIS-BR-823	DE87703720	MN -23	12:50287
4-Summ.	*See* INIS-BR-824	DE87703721	MN -37	12:50334
5	*See* INIS-BR-825	DE88700023	MN -37	12:50174
CONF-8510463-	(11. national meeting of mineral treatment and hydrometallurgy, Natal, RN, Brazil, 23-25 Oct 1985)			
1	*See* INIS-BR-765	DE87703513	MN -86	12:49318
2	*See* INIS-BR-766	DE87703514	MN -86	12:49319
3	*See* INIS-BR-767	DE87703515	MN -86	12:49320
4	*See* INIS-BR-768	DE87703516	MN -4	12:49933
5	*See* INIS-BR-769	DE87703517	MN -4	12:49934
6	*See* INIS-BR-770	DE87703518	MN -86	12:49321
7	*See* INIS-BR-771	DE87703519	MN -22	12:49467
8	*See* INIS-BR-772	DE87703520	MN -86	12:49322
9	*See* INIS-BR-773	DE87703521	MN -86	12:49323
10	*See* INIS-BR-774	DE87703522	MN -86	12:49324
11	*See* INIS-BR-775	DE87703523	MN -86	12:49325
12	*See* INIS-BR-777	DE87703524	MN -4	12:49955
13	*See* INIS-BR-778	DE87703525	MN -4	12:49956
14	*See* INIS-BR-776	DE87703702	MN -4	12:49954
CONF-8511144-	(IAEA international symposium on fuel rod internal chemistry and fission product behavior, Karlsruhe, F.R. Germany, 11-15 Nov 1985)			
	See IWGFPT-25	DE88700057	MN -80	12:49641

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CONF-8511301-	(6. conference on corrosion problems in power engineering, Zelezna Ruda, Czechoslovakia, 5-7 Nov 1985)			
	See INIS-mf-10961	DE87703558	MN -25	12:49845
CONF-8511302-	(Advisory group meeting on stable isotope labelled compounds in biomedical studies, Vienna, Austria, 26-29 Nov 1985)			
Summ.	*See* INIS-mf-10953	DE87703553	MN -23	12:49472
CONF-8602116-	(US/Japan workshop on statistical plasma physics, Nagoya, Japan, 17-21 Feb 1986)			
	See IPPJ-REV-2	DE87780166	MN -20	12:50864
CONF-8603109-	(4. European symposium on semiconductor detectors, Munich, F.R. Germany, 3-5 Mar 1986)			
8	*See* SI-86-13	DE88900063	MN -37	12:50164
CONF-8603158-	(IAEA expert meeting on spent fuel management, Vienna, Austria, 10-14 Mar 1986)			
	See IAEA-TECDOC-419	DE88700115	MN -86	12:49336
CONF-8603206-	(1. Latin American meeting on mass spectrometry, Rio de Janeiro, RJ, Brazil, 20-21 Mar 1986)			
1-Summ.	*See* INIS-BR-740	DE87703492	MN -4	12:49929
2-Summ.	*See* INIS-BR-741	DE87703493	MN -22	12:49293
3-Summ.	*See* INIS-BR-742	DE87703494	MN -4	12:49930
4-Summ.	*See* INIS-BR-743	DE87703495	MN -4	12:49931
5-Summ.	*See* INIS-BR-744	DE87703496	MN -37	12:49932
6-Summ.	*See* INIS-BR-745	DE87703497	MN -4	12:49983
CONF-8603208-	(19. annual meeting of IWGFR, Kalpakkam, India, 11-14 Mar 1986)			
	See IWGFR-60	DE87703767	MN -79	12:49598
CONF-8604348-	(Conference on automated systems of nuclear power plant control, Tale, Czechoslovakia, 15-17 Apr 1986)			
	See INIS-mf-10958	DE87703555	MN -80	12:49658
CONF-8604358-	(Technical committee meeting on advances in uranium refining and conversion, Vienna, Austria, 7-10 Apr 1986)			
	See IAEA-TECDOC-420	DE88700116	MN -86	12:49306
CONF-8605129-	(3. international meeting on lithium batteries, Kyoto, Japan, 27-30 May 1986)			
	J. Power Sources, 20: No. 1/2, 27-35(May 1987)			12:49738
CONF-8605239-	(8. seminar on production and transmission of electric power, Sao Paulo, Brazil, 4-8 May 1986)			
2	*See* INIS-BR-787	DE87703532	MN -78	12:49715
3	*See* INIS-BR-789	DE87703533	MN -80	12:49657
4	*See* INIS-BR-793	DE87703536	MN -78	12:49716
5	*See* INIS-BR-788	DE87703704	MN -78	12:49545
6	*See* INIS-BR-819	DE87703717	MN -4i	12:49546
7	*See* INIS-BR-829	DE87703725	MN -78	12:49547
8	*See* INIS-BR-830	DE87703726	MN -38	12:49632
9	*See* INIS-BR-831	DE87703727	MN -2	12:49616
CONF-8605274-	(51. Cold Spring Harbor symposium on quantitative biology: molecular biology of Homo sapiens, Cold Spring Harbor, NY, USA, 28 May-4 Jun 1986)			
Absts.	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99: DE87011013	MN -48	12:50259
CONF-8605288-	(13. national seminar of corrosion, Rio de Janeiro, Brazil, 12-16 May 1986)			
1	*See* INIS-BR-697	DE87703457	MN -25	12:49824
2	*See* INIS-BR-698	DE87703458	MN -25	12:49825
CONF-8605294-	(12. symposium of geology in northwest, Joao Pessoa, Brazil, 1 May 1986)			
1	*See* INIS-BR-850	DE87703743	MN -4	12:50322
2	*See* INIS-BR-851	DE87703744	MN -4	12:50323
3	*See* INIS-BR-852	DE87703745	MN -4	12:50324
4	*See* INIS-BR-849	DE88700026	MN -4	12:50321
CONF-8605299-	(Workshop on aging of nuclear station diesel generators: evaluation of operating and expert experience, Richland, WA, USA, 28-29 May 1986)			
Vol.2	*See* NUREG/CR-4590-Vol.2	DE87014211	MN -80	12:49638
CONF-8606111-	(6. international symposium on radiopharmaceutical chemistry, Boston, MA, USA, 29 Jun-3 Jul 1986)			
	J. Labelled Compd. Radiopharm., 23: No. 10-12, 1237-1238(Oct-Dec 1986)			12:49989
	J. Labelled Compd. Radiopharm., 23: No. 10-12, 1252-1254(Oct-Dec 1986)			12:49990
CONF-8606126-	(International Atomic Energy Agency neutron source meeting, Leningrad, USSR, 9-13 Jun 1986)			
	See IAEA-TECDOC-410	DE87703411	MN -23	12:49469
CONF-8606130-	(International conference on nuclear structure, reactions, and symmetries, Dubrovnik, Yugoslavia, 5-14 Jun 1986)			
14	*See* ATOMKI-A-19-1987	DE88700105	MN -34C	12:50590
CONF-8606208-	(9. workshop on nuclear physics, Buenos Aires, Argentina, 23 Jun-4 Jul 1986)			
3	*See* IFUSP-P-591	DE87703430	MN -34C	12:50606

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CONF-8606240-	(3. Pisa meeting on advanced detectors, Pescaia, Italy, 2-7 Jun 1986)			
4	*See* CERN-EP-86-113	DE88900032	MN -37	12:50126
CONF-8606262-	(IAEA consultants meeting on insulators for fusion applications, Karlsruhe, F.R. Germany, 25-27 Jun 1986)			
	See IAEA-TECDOC-417	DE87703681	MN -20	12:50947
CONF-8606286-	(6. international conference on proton-antiproton physics, Aachen, F.R. Germany, 30 Jun-4 Jul 1986)			
2	*See* CERN-EP-87-78	DE88900040	MN -28	12:50127
CONF-860718-	(High temperature corrosion international symposium, Marseilles, France, 7-11 Jul 1986)			
	Mater. Sci. Eng., 87: 237-242(Mar 1987)			12:49861
	Mater. Sci. Eng., 87: 295-302(Mar 1987)			12:49862
CONF-860786-	(Health and safety conference, Albuquerque, NM, USA, 15-17 Jul 1986)			
2	*See* HEDL-SA-3555-FP	E 1.99: DE87014362	MN -41	12:49395
CONF-860791-	(38. annual meeting of the Brazilian Society for the Advancement of Science, Curitiba, Brazil, 9-16 Jul 1986)			
Absts.	*See* INIS-BR-794	DE87703537	MN -41	12:50697
CONF-8607338-	(Workshop on recent developments in organic NMR, Campinas, SP, Brazil, 7-11 Jul 1986)			
	See INIS-BR-696	DE87703456	MN -4	12:49921
CONF-8607339-	(Seminar on nuclear engineering in Latin America, Mexico City, Mexico, 14-16 Jul 1986)			
1	*See* UFRJ-COPPE-PEN-138	DE87703666	MN -80	12:49669
CONF-8607341-	(Symposium on Medical Physics Esther Nunes Pereira, Curitiba, Brazil, 9-16 Jul 1986)			
1	*See* INIS-BR-798	DE87703541	MN -37	12:50148
2	*See* INIS-BR-799	DE87703542	MN -25	12:50149
3	*See* INIS-BR-800	DE87703543	MN -23	12:50702
CONF-860806-	(8. international conference on solid state dosimetry, Oxford, UK, 26-29 Aug 1986)			
	Radiat. Prot. Dosim., 17: No. 1-4, 193-200(1986)			12:50168
CONF-860808-	(7. international congress on photosynthesis, Providence, RI, USA, 10-15 Aug 1986)			
13	*See* BNL-39083	DE87011290	MN -48	12:49481
CONF-8608194-	(Consultants' meeting on reactor production and utilization of Fluorine-18, Heidelberg, F.R. Germany, 26-29 Aug 1986)			
Summ.	*See* INIS-mf-10952	DE87703552	MN -22	12:49468
CONF-8608195-	(9. workshop on nuclear physics, Caxambu, Brazil, 30 Aug-3 Sep 1986)			
Pt.1	*See* INIS-BR-837	DE87703733	MN -34C	12:50642
Pt.2	*See* INIS-BR-838	DE87703734	MN -34C	12:50511
CONF-8608198-	(CERN school of computing, Renesse, Netherlands, 30 Aug-13 Sep 1986)			
	See CERN-87-04	DE88700003	MN -32	12:50993
CONF-860943-	(6. international conference on physics in collision, Chicago, IL, USA, 3-5 Sep 1986)			
4	*See* NBI-HE-86-43	DE87752890	MN -34D	12:50410
CONF-860965-	(2. national conference on anaerobic treatment of industrial wastewaters, Chicago, IL, USA, 11-12 Sep 1986)			
	See ANL/CNSV-TM-188	E 1.99: DE88000654	MN -95e	12:49791
CONF-8609142-	(Lattice gauge theory meeting, Upton, NY, USA, 15-19 Sep 1986)			
7	*See* CEA-CONF-8841	DE87752812	MN -34D	12:50433
CONF-8609163-	(International conference and symposia on unified concepts of many-body problems, Stony Brook, NY, USA, 4-6 Sep 1986)			
13	*See* CEA-CONF-8832	DE87752810	MN -34D	12:50432
14	*See* CEA-CONF-8833	DE87752811	MN -34D	12:50516
CONF-8609223-	(ECFA workshop: LEP 200, Aachen, F.R. Germany, 29 Sep-1 Oct 1986)			
5	*See* NIKHEF-H-87-4	DE88700275	MN -34D	12:50457
CONF-8609280-	(Congress of European Society for Neurochemistry, Prague, Czechoslovakia, 1-6 Sep 1986)			
Absts.	*See* INIS-mf-10964	DE87703561	MN -48	12:50276
CONF-8609287-	(ECONMIG 86: European conference on numerical methods in geomechanics, Stuttgart, F.R. Germany, 16-18 Sep 1986)			
Vol.2	*See* INIS-mf-10707	DE87752889	MN -11	12:50332
CONF-8609319-	(3. seminar on software development in nuclear energy research, Tokai, Japan, 10-11 Sep 1986)			
	See JAERI-M-86-178	DE87780167	MN -80	12:51009
CONF-8609320-	(IAEA consultants' meeting on the assessment of the results of the REAL-84 exercise, Budapest, Hungary, 8-10 Sep 1986)			
	See INDC(NDS)-190/G-F-R	DE87703434	MN -34C	12:50507
CONF-8609339-	(2. symposium of radiological physicists, Smolenice, Czechoslovakia, 22-25 Sep 1986)			
Absts.	*See* INIS-mf-11033	DE88700238	MN -48	12:50281

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CONF-861063-	(American Society of Metals materials week, Lake Buena Vista, FL, USA, 6-9 Oct 1986)			
8	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87011808	MN -102	12:49230
CONF-8610157-	(Tritium technology workshop, Tokyo, Japan, 22-24 Oct 1986)			
	See JAERI-M-86-189	DE88780007	MN -20d	12:50976
CONF-8610160-	(IAEA technical committee meeting on gas-cooled reactors and their applications, Juelich, F.R. Germany, 20-23 Oct 1986)			
4	*See* CEA-CONF-8866	DE87752815	MN -77	12:49576
CONF-8610184-	(Conference on quantum fluids and solids, Banff, Canada, 13-17 Oct 1986)			
3	*See* CEA-CONF-8856	DE87752814	MN -34D	12:50397
CONF-8610294-	(Seminar on surface analysis, Cadarache, France, 14-17 Oct 1986)			
1	*See* CEA-CONF-8863	DE87752813	MN -4	12:49818
CONF-8610314-	(Chernobyl - environment and health aspects, Hague, Netherlands, 30 Oct 1986)			
1-Summ.	*See* INIS-mf-10988	DE87703574	MN -78	12:49723
CONF-8610317-	(4. Brazilian symposium on piping and pressure vessels, Salvador, BA, Brazil, 28-31 Oct 1986)			
1-Summ.	*See* INIS-BR-779	DE87703526	MN -80	12:49630
2-Summ.	*See* INIS-BR-780	DE87703527	MN -2	12:50988
3-Summ.	*See* INIS-BR-782	DE87703528	MN -80	12:49631
4-Summ.	*See* INIS-BR-783	DE87703529	MN -80	12:49714
5-Summ.	*See* INIS-BR-784	DE87703530	MN -25	12:49835
6	*See* LNCC-010/87	DE87703769	MN -80	12:49637
7-Summ.	*See* INIS-BR-781	DE88700021	MN -38	12:50020
CONF-8610335-	(Seminar on the Chernobyl accident and its impact, Mol, Belgium, 7 Oct 1986)			
1	*See* INIS-mf-10940	DE88700028	MN -41	12:49717
2	*See* INIS-mf-10941	DE88700029	MN -41	12:49718
3	*See* INIS-mf-10942	DE88700030	MN -41	12:49719
4	*See* INIS-mf-10943	DE88700031	MN -41	12:49720
5	*See* INIS-mf-10945	DE88700032	MN -41	12:49722
6	*See* INIS-mf-10944	DE88700118	MN -41	12:49721
CONF-8610336-	(50. annual meeting of the American Society for Information Science, Boston, MA, USA, 4-8 Oct 1986)			
1	*See* UCRL-96911	DE87012243	MN -32	12:51043
CONF-861114-	(9. international conference on application of accelerators in research and industry, Denton, TX, USA, 10-12 Nov 1986)			
57	*See* ATOMKI-B-19(1987)	DE88700107	MN -34A	12:50362
CONF-8611155-	(3. Australian Institute of Nuclear Science and Engineering conference on neutron scattering, Lucas Heights, Australia, 6-7 Nov 1986)			
Absts.	*See* INIS-mf-10998	DE88700209	MN -34A	12:50734
CONF-8611174-	(3. ISU conference, London, UK, 10-14 Nov 1986)			
1	*See* CEA-CONF-8870	DE87752816	MN -25	12:49864
CONF-8611184-	(11. annual symposium of the ACIESP, Sao Paulo, SP, Brazil, 13-14 Nov 1986)			
1-Summ.	*See* INIS-BR-797	DE87703540	MN -4	12:49986
2	*See* INIS-BR-701	DE87703692	MN -25	12:49826
3	*See* INIS-BR-702	DE87703693	MN -25	12:49827
4	*See* INIS-BR-703	DE87703694	MN -4	12:49953
5	*See* INIS-BR-705	DE87703695	MN -48	12:49466
6	*See* INIS-BR-706	DE87703696	MN -51	12:49305
7	*See* INIS-BR-707	DE87703697	MN -23	12:49471
8	*See* INIS-BR-711	DE87703698	MN -25	12:49828
CONF-8611188-	(Consultants' meeting on status and future trends of Analytical Quality Control Services, Vienna, Austria, 18-21 Nov 1986)			
Summ.	*See* IAEA-RL-146	DE88700112	MN -4	12:49913
CONF-861247-	(5. simposio Chiceno de Fisica, Santiago, Chile, 18-20 Dec 1986)			
4	*See* CEA-CONF-8926	DE88750071	MN -38	12:50006
CONF-861297-	(5. workshop of the Brazil-Chile biorganic chemical group: 1. biorganic Brazilian symposium, Florianopolis, SC, Brazil, 8-12 Dec 1986)			
1	*See* INIS-BR-699	DE87703459	MN -34A	12:50728
CONF-861298-	(5. regional symposium on biophysics, Recife, PE, Brazil, 6-8 Dec 1986)			
1-Summ.	*See* INIS-BR-737	DE87703489	MN -48	12:50295
2-Summ.	*See* INIS-BR-738	DE87703490	MN -48	12:50296
3-Summ.	*See* INIS-BR-739	DE87703491	MN -48	12:50288
CONF-861299-	(7. Brazilian congress on engineering and materials science, Florianopolis, SC, Brazil, 10-12 Dec 1986)			
1	*See* INIS-BR-755	DE87703505	MN -25	12:49829
2	*See* INIS-BR-756	DE87703506	MN -25	12:49830
3	*See* INIS-BR-757	DE87703507	MN -25	12:49831
4	*See* INIS-BR-758	DE87703508	MN -25	12:49832
5	*See* INIS-BR-759	DE87703509	MN -80	12:49686
6	*See* INIS-BR-761	DE87703510	MN -25	12:49834
7	*See* INIS-BR-762	DE87703511	MN -86	12:49317

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8	*See* INIS-BR-760		DE87703700	MN -25	12:49833
9	*See* INIS-BR-763		DE87703701	MN -25	12:49883
CONF-8612105-	(Workshop on integration of utility communication systems, Houston, TX, USA, 2-4 Dec 1986)				
	See EPRI-EL-5242		TI87920583	ND -32	12:51032
CONF-8612107-	(Fuel supply seminar. San Diego, CA, USA, 3-5 Dec 1986)				
	See EPRI-P-5417		TI88920002	ND -98	12:49747
CONF-870159-	(International conference on physics of chaos and systems far from equilibrium, Monterey, CA, USA, 11-14 Jan 1987)				
3	*See* UCRL-97268	E 1.99:	DE88000242	MN -34	12:50851
4-Rev.1	*See* UCRL-96561-Rev.1	E 1.99:	DE87014344	MN -34	12:50821
CONF-870177-	(5. Oaxtepec nuclear physics symposium, Oaxtepec, Mexico, 5-8 Jan 1987)				
2	*See* ATOMKI-A-17-1987		DE88700103	MN -34C	12:50589
CONF-870190-	(Astro-particle physics workshop, Aspen, CO, USA, 24 Jan 1987)				
1	*See* DOE/ER/03130-31	E 1.99:	DE87014478	MN -34B	12:50131
CONF-870210-	(10. energy sources technology conference and exhibition, Dallas, TX, USA, 15-18 Feb 1987)				
2	*See* PNL-SA-14517		DE88000098	MN -60	12:49509
CONF-870249-	(Computing high energy physics, Pacific Grove, CA, USA, 2-6 Feb 1987)				
10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013900	MN -32	12:50403
CONF-870258-	(3. IEEE conference on artificial intelligence applications, Orlando, FL, USA, 22-27 Feb 1987)				
1	*See* PNL-SA-14282	E 1.99:	DE88000097	MN -97b	12:49527
CONF-870272-	(American Institute of Metallurgical Engineers annual meeting: light metals session, Denver, CO, USA, 22-26 Feb 1987)				
8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87011492	MN -25	12:49865
CONF-870278-	(4. family of quarks and leptons international symposium, Santa Monica, CA, USA, 26-28 Feb 1987)				
7	*See* PITHA-87-10		DE88900061	MN -34D	12:50412
CONF-870302-	(Particle accelerator conference, Washington, DC, USA, 16-19 Mar 1987)				
249	*See* LBL-23206	E 1.99:	DE87014689	MN -32	12:50092
CONF-870317-	(Solar pond science and technology: a seminar to spread in Latin America the knowledge on solar ponds, Cuernavaca, Mexico, 23-28 Mar 1987)				
2	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE87011516	MN -59B	12:49491
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87011517	MN -59B	12:49493
CONF-870323-	(American Institute of Chemical Engineers spring national meeting, Houston, TX, USA, 29 Mar-2 Apr 1987)				
	American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017				12:49261
	American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017				12:49262
	American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017				12:49263
	American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017				12:49264
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	American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017				12:49979
	American Institute of Chemical Engineers, 345 East 47 St., New York, NY 10017				12:49980
CONF-8703127-	(4. international technical symposium on optical and electro-optical applied science and engineering, Hague, Netherlands, 30 Mar-3 Apr 1987)				
3	*See* CEA-CONF-8987		DE88750073	MN -38	12:50037

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CONF-8703128-	(International conference on advances in experimental methods for colliding beam physics, Stanford, CA, USA, 9-13 Mar 1987)			
8	*See* CERN-EP-87-89	DE88900030	MN -28	12:50128
CONF-8703157-	(Air Pollution Control Association international specialty conference on mobile sources/emerging issues, Windsor, Canada, 22-25 Mar 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87011504	MN -11	12:49287
CONF-870410-	(193. national meeting of the American Chemical Society, Denver, CO, USA, 5-10 Apr 1987)			
38	*See* TRI-PP-87-45	DE87900985	MN -34C	12:50674
CONF-870413-	(11. international conference on particles and nuclei, Kyoto, Japan, 20-24 Apr 1987)			
10	*See* TRI-PP-87-55	DE87900983	MN -34C	12:50475
11	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000058	MN -34C	12:50521
12	*See* TRI-PP-87-47	DE87900984	MN -34C	12:50535
13	*See* LA-UR-86-4202	E 1.99: DE88000433	MN -34C	12:50668
CONF-870424-	(American Nuclear Society international meeting on advances in reactor physics, mathematics and computation, Paris, France, 27-30 Apr 1987)			
15	*See* KFKI-1987-22/G	DE88700267	MN -80	12:49623
CONF-870429-	(6. annual conference on incineration of mixed and low-level radioactive wastes, St. Charles, IL, USA, 22-25 Apr 1987)			
3	*See* DP-MS-86-186	E 1.99: DE87014833	MN -70B	12:49386
CONF-870443-	(2. international conference on the basic and applied chemistry of f-transition (lanthanides and actinides) and related elements, Lisbon, Portugal, 6-10 Apr 1987)			
4	*See* DP-MS-86-200	E 1.99: DE87012943	MN -25	12:49952
CONF-870457-	(Annual meeting of Fusion Power Associates, Pleasanton, CA, USA, 8-9 Apr 1987)			
4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014936	MN -20a	12:50874
CONF-8704168-	(Workshop on particle methods in fluid dynamics and plasma physics, Los Alamos, NM, USA, 13-15 Apr 1987)			
4	*See* UCRL-97323	E 1.99: DE88000216	MN -38	12:50059
5	*See* LA-UR-87-2958	E 1.99: DE88000511	MN -32	12:51012
CONF-8704170-	(International conference on plasma physics, Kiev, USSR, 6-12 Apr 1987)			
4	*See* PPPL-2456	E 1.99: DE88000118	STD -20g	12:50360
CONF-8704202-	(European Society of Analytical Cytology and Toxicology meeting, Jerusalem, Israel, 6-10 Apr 1987)			
1	*See* UCRL-97155	E 1.99: DE87014252	MN -48	12:50261
CONF-8704203-	(International workshop on nonlinear phenomena chaos in education, Balaton, Hungary, 26 Apr-2 May 1987)			
1-Rev.1	*See* UCRL-96561-Rev.1	E 1.99: DE87014344	MN -34	12:50821
CONF-870552-	(5. conference on real-time computer applications in nuclear, particle, and plasma physics, San Francisco, CA, USA, 11-15 May 1987)			
26	*See* LA-UR-87-1497-Final	DE88000520	MN -32	12:51010
27	*See* FNAL/C-87/139	E 1.99: DE88000734	MN -32	12:51003
CONF-870594-	(International conference on thermodynamics of aqueous systems with industrial applications, Warrenton, VA, USA, 10-14 May 1987)			
2	*See* LBL-23733	E 1.99: DE88000190	MN -32	12:49406
CONF-8705103-	(Fossil energy materials program conference, Oak Ridge, TN, USA, 19-21 May 1987)			
12	*See* EGG-M-15687	E 1.99: DE87014881	MN -114	12:49867
CONF-8705163-	(From colliders to supercolliders workshop, Madison, WI, USA, 11-22 May 1987)			
8	*See* LBL-23575	E 1.99: DE88000464	MN -34D	12:50454
CONF-8705168-	(Workshop on competing interactions and microstructures: statics and dynamics, Los Alamos, NM, USA, 5-8 May 1987)			
2	*See* LA-UR-87-2611	E 1.99: DE87014741	MN -34	12:49886
CONF-8705175-	(31. Brazilian congress on ceramics, Brasilia, DF, Brazil, 24-27 May 1987)			
1	*See* INIS-BR-749	DE87703500	MN -25	12:49869
2	*See* INIS-BR-827	DE87703723	MN -86	12:49326
CONF-8705176-	(2. meeting on technology and utilization of Brazilian steels, Rio de Janeiro, RJ, Brazil, 18-22 May 1987)			
1	*See* INIS-BR-802	DE87703545	MN -25	12:49836
2	*See* INIS-BR-804	DE87703546	MN -25	12:49838
3	*See* INIS-BR-805	DE87703547	MN -25	12:49839
4	*See* INIS-BR-806	DE87703548	MN -25	12:49840
5	*See* INIS-BR-808	DE87703549	MN -25	12:49842
6	*See* INIS-BR-803	DE87703706	MN -25	12:49837
7	*See* INIS-BR-807	DE87703707	MN -25	12:49841
8	*See* INIS-BR-811	DE87703709	MN -25	12:49843
CONF-8705180-	(14. national seminar of corrosion, Sao Paulo, Brazil, 11-15 May 1987)			
1	*See* INIS-BR-832	DE87703728	MN -4	12:49935

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CONF-8705181-	(10. national meeting on condensed matter physics, Caxambu, Brazil, 5-8 May 1987)			
1	*See* INIS-BR-834	DE87703730	MN -41	12:50703
2	*See* INIS-BR-835	DE87703731	MN -37	12:50150
3	*See* INIS-BR-836	DE87703732	MN -37	12:50151
CONF-8705182-	(2. meeting of the southern hemisphere on mineral technology and 12. national meeting on mineral treatment and hydrometallurgy, Rio de Janeiro, Brazil, 25-29 May 1987)			
1	*See* INIS-BR-853	DE87703746	MN -86	12:49327
2	*See* INIS-BR-854	DE87703747	MN -86	12:49328
3	*See* INIS-BR-855	DE87703748	MN -4	12:49957
4-Pt.2	*See* INIS-BR-856	DE87703749	MN -86	12:49329
5	*See* INIS-BR-857	DE87703750	MN -4	12:49936
6	*See* INIS-BR-859	DE87703751	MN -4	12:49937
7	*See* INIS-BR-860	DE87703752	MN -86	12:49330
8	*See* INIS-BR-861	DE87703753	MN -86	12:49331
9	*See* INIS-BR-862	DE87703754	MN -86	12:49332
10	*See* INIS-BR-863	DE87703755	MN -4	12:49938
11	*See* INIS-BR-864	DE87703756	MN -4	12:49959
12	*See* INIS-BR-858	DE88700027	MN -4	12:49958
CONF-8705192-	(Nuclear power plant control and instrumentation IAEA/NPPCI specialists' meeting, Roskilde, Denmark, 25-27 May 1987)			
1	*See* KFKI-1987-28/M	DE88700130	MN -78	12:49667
CONF-8705194-	(3. international workshop on desorption induced by electronic transitions, Shelter Island, NY, USA, 20-22 May 1987)			
1	*See* SAND-87-0644C	E 1.99: DE87013011	MN -34A	12:50383
2	*See* SAND-87-1832C	E 1.99: DE87013012	MN -34A	12:50819
CONF-870629-	(14. European conference on controlled fusion and plasma physics, Madrid, Spain, 22-26 Jun 1987)			
10	*See* PPPL-2455	E 1.99: DE88000119	STD -20d	12:50923
CONF-870632-	(International Europhysics conference on high energy physics, Uppsala, Sweden, 25 Jun-1 Jul 1987)			
5	*See* CERN-EP-87-120	DE88900031	MN -34D	12:50408
7	*See* SLAC-PUB-4372	DE88000699	MN -34D	12:50413
CONF-870637-	(Summer meeting of the American Society of Mechanical Engineers, Cincinnati, OH, USA, 14-18 Jun 1987)			
4	*See* UCRL-96320	E 1.99: DE87007333	MN -38	12:50179
CONF-870665-	(Society for Experimental Mechanics spring meeting, Houston, TX, USA, 14-19 Jun 1987)			
6	*See* UCRL-94353	E 1.99: DE87008764	MN -132	12:49298
CONF-870695-	(80. annual meeting of the Air Pollution Control Association, New York, NY, USA, 1 Jun 1987)			
7	*See* PNL-SA-14953	E 1.99: DE87012167	MN -11	12:50227
CONF-8706125-	(Conference on advances in cryogenic engineering, St. Charles, IL, USA, 14-18 Jun 1987)			
12	*See* LBL-23823	E 1.99: DE87014684	MN -38	12:50024
13	*See* LBL-23822	E 1.99: DE87014683	MN -38	12:50023
CONF-8706155-	(6. IEEE pulsed power conference, Washington, DC, USA, 29 Jun-1 Jul 1987)			
2	*See* SAND-87-0642C	DE87012360	MN -38	12:50032
CONF-8706156-	(Workshop on evaluation of the TRAC dispersion model, Golden, CO, USA, 24 Jun 1987)			
2-Vugraphs	*See* RFP-4145	E 1.99: DE87012085	MN -11	12:50190
CONF-8706161-	(2. international conference on muon and pion interactions in matter, Dubna, USSR, 30 Jun-4 Jul 1987)			
2	*See* LBL-23816	E 1.99: DE88000619	MN -34C	12:50520
CONF-8706166-	(International symposium on medium energy physics, Beijing, China, 23-27 Jun 1987)			
4	*See* LA-UR-87-3053	E 1.99: DE88000526	MN -34C	12:50519
CONF-8706183-	(ICS '87: international conference on supercomputing, Athens, Greece, 8-12 Jun 1987)			
1	*See* DOE/ER/25009-392	E 1.99: DE87013093	MN -32	12:51000
CONF-8706185-	(Charm physics symposium, Beijing, China, 4-16 Jun 1987)			
2	*See* SLAC-PUB-4349	E 1.99: DE87013586	MN -34D	12:50458
CONF-8706192-	(Conference on undulator magnets for synchrotron radiation and free electron lasers, Trieste, Italy, 23-26 Jun 1987)			
3	*See* LA-UR-87-2981	E 1.99: DE88000505	MN -38	12:50040
CONF-8706194-	(Southern biomass working group, Biloxi, MS, USA, 8-11 Jun 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014054	MN -61F	12:49482
CONF-8706198-	(27. Cracow school of theoretical physics, Zakopane, Poland, 3-15 Jun 1987)			
1	*See* SLAC-PUB-4353	DE87014609	MN -34D	12:50494
CONF-8706200-	(CEBAF summer workshop, Newport News, VA, USA, 22-26 Jun 1987)			
4	*See* BNL-40147	E 1.99: DE87014392	MN -34C	12:50591

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CONF-8706204-	(6. Institute of Electrical and Electronis Engineers pulsed power conference, Baltimore, MD, USA, 29 Jun-1 Jul 1987)			
1	*See* UCRL-96239	E 1.99: DE87013558	MN -34	12:50178
CONF-8706205-	(Conference on computer codes for the probabilistic assessment of accident consequences, Vienna, Austria, 22-26 Jun 1987)			
1	*See* BNL-NUREG-40272	E 1.99: DE87014923	MN -78	12:49705
CONF-8706210-	(BAM seminar on containers for radioactive materials made from ductile cast iron, West Berlin, F.R. Germany, 9-10 Jun 1987)			
1	*See* SAND-87-1707C	E 1.99: DE87012874	MN -71	12:49360
2	*See* SAND-87-1708C	E 1.99: DE87013061	MN -71	12:49361
CONF-8706212-	(International symposium on strangeness in hadronic matter, Bad Honnef, F.R. Germany, 1-5 Jun 1987)			
1	*See* LBL-23921	E 1.99: DE88000461	MN -34D	12:50409
2	*See* LA-UR-87-2892	E 1.99: DE87014746	MN -34C	12:50669
CONF-870724-	(24. annual conference on nuclear and space radiation in electronics, Snowmass, CO, USA, 28-31 Jul 1987)			
18	*See* SAND-87-1602C	E 1.99: DE87011321	MN -38	12:50069
CONF-870734-	(American Association for Artificial Intelligence meeting, Seattle, WA, USA, 13-17 Jul 1987)			
3	*See* PNL-SA-14674	E 1.99: DE88000093	MN -38	12:50004
CONF-870739-	(Workshop on experiments, detectors, and experimental areas for the supercollider, Berkeley, CA, USA, 7-17 Jul 1987)			
2	*See* BNL-40217	E 1.99: DE87014917	MN -34D	12:50429
CONF-870753-	(5. topical conference of the American Physical Society on shockwaves in condensed matter, Monterey, CA, USA, 20-23 Jul 1987)			
73	*See* SAND-87-0967C	E 1.99: DE87013723	MN -34	12:50818
CONF-870784-	(NATO workshop on atomic and molecular processes with short intense laser pulse, Sherbrooke, Canada, 19-24 Jul 1987)			
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87013545	MN -34A	12:50363
CONF-870799-	(American conference on crystal growth, Monterey, CA, USA, 13-17 Jul 1987)			
2	*See* LBL-22904	E 1.99: DE88000189	MN -4	12:49888
CONF-8707103-	(International conference on DNA damage and repair, Rome, Italy, 12-17 Jul 1987)			
1	*See* BNL-40073	DE87014288	MN -48	12:50292
CONF-8707106-	(INTOR workshop, Vienna, Austria, 13-24 Jul 1987)			
2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87014064	MN -20	12:50938
CONF-8707107-	(1. international conference on laser M 2 P, Lyon, France, 7-9 Jul 1987)			
1	*See* UCRL-96859	E 1.99: DE87014247	MN -38	12:50042
CONF-870802-	(194. American Chemical Society national meeting, New Orleans, LA, USA, 30 Aug-4 Sep 1987)			
15	*See* DP-MS-87-23	E 1.99: DE87014200	MN -70	12:49387
17	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87012145	MN -102	12:49249
18	*See* PNL-SA-15090	E 1.99: DE88000092	MN -108	12:49246
20	*See* BNL-40211	E 1.99: DE87014910	MN -34B	12:50338
21	*See* SLAC-PUB-4409	DE88000698	MN -34B	12:50347
CONF-870804-	(22. intersociety energy conversion engineering conference, Philadelphia, PA, USA, 10-14 Aug 1987)			
41	*See* PNL-SA-14920	DE88000096	MN -38	12:50078
CONF-870811-	(Energy conservation program evaluation: practical methods and useful results, Chicago, IL, USA, 19-21 Aug 1987)			
5	*See* PNL-SA-15089	E 1.99: DE88000082	MN -95d	12:49778
6	*See* PNL-SA-15011	E 1.99: DE88000088	MN -95d	12:49777
CONF-870820-	(PSA 87: international topical meeting on probabilistic safety assessment and risk management, Zurich, Switzerland, 31 Aug-4 Sep 1987)			
8	*See* EGG-M-18587	E 1.99: DE87014872	MN -78	12:49713
CONF-870822-	(American Institute of Chemical Engineers summer national meeting, Minneapolis, MN, USA, 16-19 Aug 1987)			
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87013542	MN -38	12:50007
CONF-870825-	(International conference on the applications of the Mossbauer effect, Melbourne, Australia, 17-21 Aug 1987)			
1	*See* LA-UR-87-2774	E 1.99: DE87014771	MN -25	12:49887
CONF-870832-	(Topical meeting on artificial intelligence and other innovative computer applications in the nuclear industry, Snowbird, UT, USA, 31 Aug-2 Sep 1987)			
5	NTIS, PC A02; 3	DE87014780	MN -80	12:49652
CONF-870839-	(3. international symposium on environmental degradation of materials in nuclear power systems: water reactors, Traverse City, MI, USA, 30 Aug-3 Sep 1987)			
3	NTIS, PC A02; 3	DE88000340	MN -25	12:49820
4	NTIS, PC A02; 3	DE88000341	MN -78	12:49544

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CONF-870859-	(9. annual low-level radioactive waste management program conference, Denver, CO, USA, 25-27 Aug 1987)			
5	*See* DP-MS-87-78	E 1.99: DE87014439	MN -70B	12:49391
6	*See* DP-MS-87-81	E 1.99: DE87014196	MN -70B	12:49393
8	*See* DP-MS-87-79	E 1.99: DE87014195	MN -70B	12:49392
10	*See* DP-MS-87-95	E 1.99: DE87014435	MN -70B	12:49394
11	*See* DP-MS-87-47	E 1.99: DE87014436	MN -70B	12:49389
12	*See* BNL-NUREG-40094	E 1.99: DE87014290	MN -70B	12:49373
13-Vugraphs	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014568	MN -70B	12:49374
14	*See* LA-UR-87-2855	E 1.99: DE87014755	MN -70B	12:49405
16	*See* DP-MS-87-60	E 1.99: DE87014831	MN -70B	12:49390
CONF-870860-	(6. international conference on mathematical modelling, Saint Louis, MO, USA, 4-7 Aug 1987)			
2	*See* SAND-86-2480C	DE88000394	MN -32	12:51020
CONF-870863-	(Seminar on small and medium-sized nuclear reactors: safety and licensing issues, Lausanne, Switzerland, 24-26 Aug 1987)			
4	*See* DOE/HTGR-87-088	E 1.99: DE88000053	MN -77	12:49577
CONF-870898-	(Joint statistical meeting, San Francisco, CA, USA, 16-20 Aug 1987)			
2	*See* SAND-87-0819C	E 1.99: DE87013724	MN -80	12:49727
CONF-8708101-	(6. international symposium on capture gamma-ray spectroscopy, Leuven, Belgium, 31 Aug-4 Sep 1987)			
10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87012933	MN -34C	12:50564
12	*See* LA-UR-87-3191	E 1.99: DE88000489	MN -34C	12:50528
CONF-8708102-	(Pion nucleus physics: future directions and new facilities at LAMPF workshop, Los Alamos, NM, USA, 17-21 Aug 1987)			
4	*See* LA-UR-87-2909	E 1.99: DE88000516	MN -34C	12:50670
CONF-8708110-	(31. SPIE annual international technical symposium on optical and optoelectronic applied science and engineering, San Diego, CA, USA, 16-21 Aug 1987)			
14	*See* SAND-87-1614C	E 1.99: DE87011305	MN -34	12:50850
15	*See* UCRL-96005	DE87013803	MN -37	12:50166
16	*See* UCRL-97383	E 1.99: DE88000229	MN -38	12:50035
17	*See* SAND-87-0160C	E 1.99: DE87013446	MN -38	12:50031
18	*See* UCRL-96004	DE87013487	MN -37	12:50165
20	*See* LA-UR-87-3305	E 1.99: DE88000480	MN -37	12:50176
CONF-8708121-	(6. international conference on biomagnetism, Tokyo, Japan, 27-30 Aug 1987)			
1	*See* LA-UR-87-2683	E 1.99: DE87014730	MN -48	12:50258
2	*See* LA-UR-87-2682	E 1.99: DE87014731	MN -48	12:50257
CONF-8708123-	(International conference on nuclear structure through static and dynamic moments, Melbourne, Australia, 25-28 Aug 1987)			
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014934	MN -34C	12:50565
CONF-8708127-	(International Energy Agency workshop on economic evaluations of short rotation biomass energy systems, Duluth, MN, USA, 11-13 Aug 1987)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87014799	MN -61A	12:49483
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87013677	MN -61A	12:49484
CONF-8708129-	(NATO-ASI conference on materials modification by high-fluence ion beams, Viana do Castelo, Portugal, 24 Aug-4 Sep 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014053	MN -25	12:49866
CONF-8708132-	(19. general assembly International Union of Geodesy and Geophysics, Vancouver, Canada, 9-22 Aug 1987)			
1	*See* UCRL-96144	E 1.99: DE87014348	MN -11	12:50187
CONF-8708134-	(18. annual meeting of the Fine Particle Society, Boston, MA, USA, 3-7 Aug 1987)			
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000147	MN -115	12:49270
CONF-8708135-	(3. workshop on high energy ion-atom collisions, Debrecen, Hungary, 3-5 Aug 1987)			
1	NTIS, PC A02; 3	DE87014950	MN -34A	12:50364
CONF-8708137-	(VHSIC/VLSI qualification reliability and logistics conference, Colorado Springs, CO, USA, 25-27 Aug 1987)			
1-Vugraphs	*See* SAND-87-1001C	E 1.99: DE87014157	MN -38	12:50068
CONF-8708138-	(U.S./USSR fusion materials workshop, Oak Ridge, TN, USA, 31 Aug-2 Sep 1987)			
1-Vugraphs	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014570	MN -20c	12:50939
CONF-8708139-	(International symposium on polymers for advanced technologies, Jerusalem, Israel, 16-21 Aug 1987)			
2	*See* SERI/TP-255-3205	E 1.99: DE88001102	MN -62	12:49492
CONF-8708140-	(International workshop on Pi, Eta, Rho and omega mesons, Los Alamos, NM, USA, 14 Aug 1987)			
1	*See* LA-UR-87-3126	E 1.99: DE88000535	MN -34C	12:50672
2	*See* LA-UR-87-3094	E 1.99: DE88000519	MN -34C	12:50671
CONF-8708141-	(6. meeting of solar wind, Estes Park, CO, USA, 24-28 Aug 1987)			
1	*See* LA-UR-87-2977	E 1.99: DE88000507	MN -34B	12:50345
3	*See* LA-UR-87-2803	E 1.99: DE87014768	MN -34B	12:50920

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CONF-8708142-	(Symposium on applications of microorganisms to petroleum technology, Bartlesville, OK, USA, 12-13 Aug 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014953	MN -122	12:49275
CONF-8708143-	(11. European conference on few-body physics, Fontevraud, France, 31 Aug-5 Sep 1987)			
1	*See* BNL-40210	E 1.99: DE87014920	MN -34C	12:50515
CONF-8708150-	(36. annual Denver X-ray conference, Denver, CO, USA, 3-7 Aug 1987)			
2	*See* MLM-3455(OP)	E 1.99: DE88000729	MN -4	12:49945
CONF-870901-	(10. international conference on magnet technology (MT-10), Boston, MA, USA, 21-26 Sep 1987)			
2	*See* UCRL-95920	E 1.99: DE88000214	MN -38	12:50041
CONF-870908-	(Course and workshop on physics of mirrors, reversed field pinches and compact tori, Varenna, Italy, 1-11 Sep 1987)			
5	*See* UCRL-96665	E 1.99: DE88000224	MN -20b	12:50925
6	*See* UCRL-96672	E 1.99: DE88000217	MN -20g	12:50926
CONF-870909-	(Conference on nuclear interactions and structures, Brighton, UK, 7-9 Sep 1987)			
1	*See* BNL-40222	E 1.99: DE87014912	MN -34C	12:50402
2	*See* BNL-40216	E 1.99: DE87014921	MN -34C	12:50592
CONF-870948-	(American Nuclear Society topical meeting on the integrated spent fuel and HLW management system, Albuquerque, NM, USA, 27 Sep-1 Oct 1987)			
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014949	MN -85	12:49375
CONF-870970-	(5. international conference on nuclei far from stability, Lake Rosseau, Canada, 14-19 Sep 1987)			
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000569	MN -34C	12:50546
CONF-870977-	(International rain conference, Lisbon, Portugal, 1-3 Sep 1987)			
1	*See* UCRL-96286	E 1.99: DE87009847	MN -11	12:50210
CONF-870980-	(International conference on advances in material technology for fossil power plants, Chicago, IL, USA, 1-3 Sep 1987)			
1	NTIS, PC A02; 3	DE87014788	MN -114	12:49821
CONF-8709104-	(ANS topical conference on population exposure from nuclear fuel cycle, Oak Ridge, TN, USA, 15-18 Sep 1987)			
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014786	MN -80	12:49712
CONF-8709110-	(9. international free-electron laser conference, Williamsburg, VA, USA, 14-18 Sep 1987)			
3	*See* UCRL-97348	E 1.99: DE88000225	MN -21	12:50043
7	*See* LA-UR-87-2961	DE88000510	MN -38	12:50039
CONF-8709115-	(International school of radiation damage and protection, Sicily, Italy, 24 Sep-3 Oct 1987)			
2	*See* SAND-87-1775C	E 1.99: DE87013064	MN -32	12:51022
CONF-8709119-	(Workshop on water-cooled reactor aerosol code evaluation and uncertainty assessment, Brussels, Belgium, 9-11 Sep 1987)			
2	*See* SAND-87-0943C	E 1.99: DE87013649	MN -78	12:49728
CONF-8709128-	(1. International Association for Statistical Computing world conference, Shizuoka, Japan, 17-19 Sep 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87013874	MN -32	12:50997
CONF-8709129-	(USABRDL contractor's review meeting, Frederick, MD, USA, 15-16 Sep 1987)			
4-Vugraphs	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87013875	MN -4	12:49995
CONF-8709132-	(6. international conference on secondary ion mass spectrometry - SIMS VI, Versailles, France, 13-18 Sep 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000346	MN -4	12:49910
CONF-8709134-	(2. international workshop activation analysis with short-lived nuclides, Vienna, Austria, 21-24 Sep 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000331	MN -80	12:49676
CONF-8709135-	(14. international conference on X-ray and inner-shell processes, Paris, France, 14-18 Sep 1987)			
1	*See* UCRL-96701	E 1.99: DE88000218	MN -34	12:50385
CONF-8709136-	(Chemical reactions in the liquid state center for computational chemistry workshop, Orsay, France, 7-11 Sep 1987)			
1	*See* BNL-40183	DE87014395	MN -4	12:49951
CONF-871013-	(5. SMORN: international conference on reactor noise, Munich, F.R. Germany, 12-16 Oct 1987)			
5	NTIS, PC A02; 3	DE87013871	MN -78	12:49653
Summ.	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014411	MN -78	12:49533
CONF-871018-	(International decommissioning symposium, Pittsburgh, PA, USA, 4-8 Oct 1987)			
5	*See* LA-UR-87-1916	E 1.99: DE87011789	MN -70	12:49404
Vol.1	NTIS, PC A24; 3	DE87012821	MN -70A	12:49376
Vol.2	NTIS, PC A99/MF A01; 1 (GPO Dep.)	E 1.99: DE87012822	MN -70A	12:49377
CONF-871027-	(172. meeting of the Electrochemical Society, Honolulu, HI, USA, 18-23 Oct 1987)			
8	*See* SAND-87-0996C	E 1.99: DE87009048	MN -94c	12:49734

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
32	*See* SAND-87-0148C	E 1.99: DE87013471	MN -38	12:50401
CONF-871030-	(International conference on coal science, Maastricht, Netherlands, 26-30 Oct 1987)			
8	*See* PNL-SA-15085	E 1.99: DE88000085	MN -102	12:49245
CONF-871036-	(3. international conference on fusion reactor materials, Karlsruhe, F.R. Germany, 4-8 Oct 1987)			
1	*See* UCRL-96198	E 1.99: DE88000047	MN -20c	12:50981
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000337	MN -20c	12:50934
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000333	MN -20c	12:50935
4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000332	MN -20c	12:50936
CONF-871062-	(Windpower '87, San Francisco, CA, USA, 5-8 Oct 1987)			
1	*See* SAND-87-0838C	E 1.99: DE88000431	MN -60	12:49510
2	*See* SAND-87-1131C	E 1.99: DE88000604	MN -60	12:49511
CONF-8710124-	(Conference on systems, man, and cybernetics, Alexandria, VA, USA, 20-23 Oct 1987)			
3	*See* SAND-87-1007C	E 1.99: DE87013066	MN -38	12:50033
5	*See* LA-UR-87-2543	E 1.99: DE87013172	MN -13	12:51011
CONF-8710126-	(58. shock and vibration symposium, Huntsville, AL, USA, 13-15 Oct 1987)			
3	*See* SAND-87-1441C	DE87013927	MN -38	12:50065
4	*See* SAND-87-1369C	E 1.99: DE87013811	MN -38	12:50064
CONF-8710132-	(Department of Energy automated office support system conference, Denver, CO, USA, 7-8 Oct 1987)			
4	*See* DP-MS-87-103	E 1.99: DE87014842	MN -32	12:51031
CONF-8710135-	(SEM fall meeting, Savannah, GA, USA, 25-28 Oct 1987)			
3	*See* SAND-87-0166C	E 1.99: DE87013650	MN -38	12:50063
CONF-8710149-	(Interex - HP 1000 and HP 9000 user's technical conference, San Jose, CA, USA, 18-22 Oct 1987)			
1	*See* SAND-87-0454C	E 1.99: DE87010511	MN 32	12:51021
CONF-8710152-	(6. world congress on human reproduction, Tokyo, Japan, 25-30 Oct 1987)			
1	*See* UCRL-97380	E 1.99: DE88000426	MN -48	12:50262
CONF-8710155-	(8. international ash utilization symposium, Washington, DC, USA, 28-31 Oct 1987)			
Vol.1	*See* EPRI-CS-5362-Vol.1	E 1.99: DE88000539	MN -107	12:49257
Vol.2	*See* EPRI-CS-5362-Vol.2	DE88000540	MN -107	12:49258
CONF-8710163-	(3. annual conference on artificial intelligence and Ada, Fairfax, VA, USA, 14-15 Oct 1987)			
1	*See* UCRL-96632	E 1.99: DE88000220	MN -32	12:51024
CONF-871101-	(Joint meeting of the American Nuclear Society and the Atomic Industrial Forum, Los Angeles, CA, USA, 15-19 Nov 1987)			
1	*See* SAND-87-1372C	E 1.99: DE87010518	MN -71	12:49359
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87010901	MN -32	12:50994
7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011159	MN -34C	12:50680
8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87010890	MN -32	12:50129
10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011374	MN -79	12:49654
11	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011375	MN -79	12:49580
12	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011376	MN -78	12:49708
13	*See* SAND-87-1682C	E 1.99: DE87011281	MN -34A	12:50384
14	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87011372	MN -79p	12:49581
15	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87011370	MN -79p	12:49582
16	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011373	MN -79p	12:49709
17	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011368	MN -79e	12:49675
18	*See* BNL-39916	E 1.99: DE87011297	MN -80	12:49575
19	*See* BNL-NUREG-39917	DE87011296	MN -78	12:49696
20	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87011371	MN -79p	12:49710
21	NTIS, PC A02/MFA01; 1 (GPO Dep.)	E 1.99: DE87011369	MN -79a	12:49583
22	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011646	MN -80	12:49655
23	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011645	MN -80	12:49618
26	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87011666	MN -80	12:49619
27	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011944	MN -78	12:49711
29	NTIS, PC A02; 3	DE87011641	MN -98E	12:49740
31	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87011583	MN -70B	12:49378
34	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87011668	MN -32	12:50995
35	*See* BNL-NUREG-39956	E 1.99: DE87012119	MN -79	12:49702
36	*See* BNL-NUREG-39959	E 1.99: DE87012109	MN -78	12:49704
37	*See* BNL-NUREG-39933	E 1.99: DE87011921	MN -78	12:49699
38	*See* BNL-NUREG-39935	DE87012173	MN -80	12:49674
39	*See* BNL-NUREG-39932	E 1.99: DE87012113	MN -78	12:49698
40	*See* BNL-NUREG-39958	E 1.99: DE87012494	MN -78	12:49703
41	*See* BNL-NUREG-39936	E 1.99: DE87012172	MN -78	12:49701
44	*See* BNL-NUREG-39970	E 1.99: DE87012484	MN -80	12:49625
46	*See* BNL-NUREG-39928	E 1.99: DE87012122	MN -78	12:49639
47	*See* BNL-NUREG-39957	E 1.99: DE87012120	MN -79	12:49578
49	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87012927	MN -85	12:49352
50	*See* BNL-NUREG-39929	E 1.99: DE87012121	MN -78	12:49697
51	*See* BNL-NUREG-39923	E 1.99: DE87012124	MN -80	12:49624
52	*See* BNL-NUREG-39934	E 1.99: DE87012112	MN -78	12:49700
55	*See* HEDL-SA-3721-FP	E 1.99: DE87014383	MN -38	12:50019
58	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87013754	MN -20c	12:50937

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CONF-871102-	(International waste management conference, Kowloon, China, 30 Nov-5 Dec 1987)			
1	*See* DP-MS-87-34	E 1.99: DE87010201	MN -70	12:49388
CONF-871112-	(3. international photovoltaic science and engineering conference, Tokyo, Japan, 3-6 Nov 1987)			
1	*See* SAND-87-2135C	E 1.99: DE87014214	MN -63	12:49487
CONF-871113-	(American Institute of Chemical Engineers annual meeting, New York, NY, USA, 15-20 Nov 1987)			
1	*See* LA-UR-87-2561	E 1.99: DE87013174	MN -38	12:50022
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014405	MN -4	12:49909
CONF-871118-	(Combustion Institute fall meeting, Honolulu, HI, USA, 22-25 Nov 1987)			
1	*See* UCRL-97180	DE87013799	MN -38	12:49813
2	*See* SAND-87-1443C	E 1.99: DE87014173	MN -38	12:49997
3	*See* SAND-87-1444C	DE87014193	MN -38	12:49998
4	*See* SAND-87-1357C	E 1.99: DE87014102	MN -25	12:49996
5	*See* UCRL-96680	E 1.99: DE87014253	MN -38	12:49999
CONF-871122-	(9. annual IAEE North American conference, Washington, DC, USA, 11-13 Nov 1987)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000577	MN -121	12:49274
CONF-871124-	(Fall meeting of the Materials Research Society, Boston, MA, USA, 30 Nov-5 Dec 1987)			
1	*See* LA-UR-87-1991	DE87011777	MN -25	12:49872
CONF-871125-	(34. national vacuum symposium and topical conference, Anaheim, CA, USA, 2-5 Nov 1987)			
2	*See* SAND-87-2320C	E 1.99: DE87013715	MN -34A	12:50820
CONF-871126-	(32. conference on magnetism and magnetic materials, Chicago, IL, USA, 9-12 Nov 1987)			
1	*See* BNL-40220	E 1.99: DE87014911	MN -25	12:49879
2	*See* UCRL-96764	E 1.99: DE88000228	MN -4	12:49856
CONF-871131-	(Combined meetings of the Eastern Section of the Combustion Institute 20th fall technical meeting on chemical and physical processes in combustion and National Bureau of Standards annual conference, Gaithersburg, MD, USA, 2-6 Nov 1987)			
1	*See* SAND-87-1920C	E 1.99: DE87013445	MN -71	12:49362
CONF-871134-	(International conference on precision engineering, Osaka, Japan, 1 Nov 1987)			
1	*See* UCRL-96700	DE87010873	MN -38	12:50005
CONF-871136-	(29. international conference of the Association for the Development of Computer-Based Instruction of Systems (ADCIS), Oakland, CA, USA, 9-12 Nov 1987)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87011123	MN -13	12:50996
CONF-871142-	(International fuels and lubricants meeting and exposition, Toronto, Canada, 2-5 Nov 1987)			
1-Rev.	*See* LA-UR-87-2105-Rev.	E 1.99: DE87011756	MN -34	12:50400
2	*See* UCRL-97082	E 1.99: DE87013226	MN -4	12:50000
CONF-871163-	(SPIE Cambridge symposium on intelligent robots and computer vision, Cambridge, MA, USA, 1-6 Nov 1987)			
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87013878	MN -38	12:50008
2	NTIS, PC A02; 3	DE87013872	MN -38	12:50009
3	*See* DOE/DP/40200-52	E 1.99: DE88000358	MN -32	12:50998
4	*See* SAND-87-2363C	E 1.99: DE88000360	MN -38	12:50034
COO-				
3130TC-31	*See* DOE/ER/03130-31	E 1.99: DE87014478	MN -34B	12:50131
CRN-CPR-				
86-05	NTIS (US Sales Only), PC A07/MF A01	DE87752808	MN -34A	12:50718
86-08	NTIS (US Sales Only), PC A03/MF A01	DE87752806	MN -38	12:50398
86-09	NTIS (US Sales Only), PC A03/MF A01	DE87752807	MN -38	12:50365
CRN-HE-				
86-03	NTIS (US Sales Only), PC A02/MF A01	DE87752805	MN -34D	12:50472
CRN-PN-				
86-15	NTIS (US Sales Only), PC A08/MF A01	DE87752809	MN -37	12:50130
CTA-IEAV-NT-				
02/ 87	NTIS (US Sales Only), PC A02/MF A01	DE87703402	MN -41	12:50695
05/ 87	NTIS (US Sales Only), PC A02/MF A01	DE87703403	MN -34B	12:50220
CTR-				
3-9-84-364-1	*See* PB-87-204459/XAB			12:49889
3-9-85-450-1	*See* PB-87-209995/XAB			12:49892
3-18-83-359-2	*See* PB-87-204467/XAB			12:49890
DGMK-				
295-2	Deutsche Wissenschaftliche Gesellschaft fuer Erdoel, Erdgas und Kohle e.V., Hamburg, Germany, F.R.		ND -122	12:49276
DOE/AL/33183-				
T4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014983	MN -96	12:49810
DOE/BC-				
86/ 4	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87001231	STD -122	12:49277
DOE/BP/11287-				
1	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87014960	MN -95d	12:49764
5	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE88000011	MN -95d	12:49765
16	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE88000010	MN -95d	12:49766

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DOE/CE/15185-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000148	MN -95f	12:50015
DOE/CE/15268-T2	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87014631	MN -38	12:50016
DOE/CE/15278-T5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000396	MN -60	12:49504
DOE/CE/15279-T5	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87014656	MN -60	12:49505
T6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000395	MN -60	12:49506
DOE/CE/15303-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000152	MN -122	12:49296
DOE/CE/63479-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000150	MN -95f	12:49767
DOE/CE/63499-T6	NTIS, PC A23; 3	DE88000201	MN -95	12:49768
DOE/CE/63500-T1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000151	MN -95d	12:49769
DOE/CE/76249-1	NTIS, PC A07; 3	DE87013720	MN -97b	12:49525
DOE/CH/10249-T1	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE87014867	MN -60	12:49507
DOE/DP/40200-29	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87014650	MN -21	12:50038
52	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000358	MN -32	12:50998
DOE/EIA-0035(87/ 06)	NTIS, PC A07/MF A01 - GPO; 1 (GPO Dep.)	E 1.99: DE88000278	MN -98	12:49284
0380(87/ 06)	NTIS, PC A08/MF A01 - GPO; 1 (GPO Dep.)	E 1.99: DE87014990	MN -98B	12:49285
DOE/ER-0191/ 4	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000689	STD -2	12:50404
0333	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE88000347	MN -20	12:50875
0346	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87014719	MN -48	12:50256
DOE/ER/03077-283	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87014806	MN -32	12:50399
DOE/ER/03130-31	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014478	MN -34B	12:50131
DOE/ER/05489-T2	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE87014168	MN -25	12:49880
DOE/ER/10857-T3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000310	MN -37	12:50172
DOE/ER/12035-1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000154	MN -66	12:49500
DOE/ER/25001-31	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE88000807	MN -32	12:50999
DOE/ER/25009-392	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87013093	MN -32	12:51000
DOE/ER/53198-111	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE88000447	STD -20f	12:50876
DOE/ER/53223-45	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE88000202	MN -34A	12:50877
DOE/ER/60174-2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014530	MN -48	12:50311
DOE/ER/60292-3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87012750	MN -11	12:50192
DOE/ER/60415-T1	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE88000378	MN -34	12:50719
DOE/ER/60508-1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000139	MN -4	12:49911
DOE/ER/60510-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014803	MN -48	12:50294
DOE/ER/60529-1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87014822	MN -48	12:50228
DOE/ET/15397-T6-Vol.2	NTIS, PC A13/MF A01; 1 (GPO Dep.)	E 1.99: DE87014454	MN -93	12:49811
DOE/ET/53088-298	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000305	MN -20	12:50878
299	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000306	MN -20	12:51001
300	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000307	MN -20g	12:50879
DOE/EV/03140-10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87014801	MN -48	12:50312
DOE/FE/60177-2433	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE88000386	MN -123	12:49303
2434	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000911	STD -123	12:49304
DOE/HTGR-87-088	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000053	MN -77	12:49577
DOE/HWP-39	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000670	STD -69	12:49379
DOE/ID/12313-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014528	MN -70B	12:49380
T2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87014529	MN -70B	12:49381
DOE/ID/12511-T5	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99: DE87014511	MN -70B	12:49382
DOE/ID/12527-3-Vol.1	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99: DE88000639	MN -95	12:49807

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
DOE/ID/12552-					
1	NTIS, PC A03; 3		DE87014931	MN -66g	12:49501
DOE/ID/12564-					
T1	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014504	MN -70B	12:49383
T2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014505	MN -70B	12:49384
DOE/MC/22045-					
2364	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99:	DE87006518	STD -110	12:49754
DOE/MI/10075-					
T1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000182	MN -13	12:51030
DOE/NBM-					
7013294	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87013294	MN -70	12:49385
DOE/NE/37959-					
12	NTIS, PC A09; 3		DE88000187	MN -80	12:49656
DOE/NV/10384-					
20-Vol.2	NTIS, PC A22/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012991	MN -70	12:50330
DOE/PC/70003-					
F2	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE87011681	STD -108	12:49238
DOE/PC/80518-					
T8	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014935	MN -102	12:49239
DOE/PC/80533-					
T8	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000072	MN -102	12:49250
DOE/PC/80907-					
T7	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000299	MN -108	12:49240
DOE/PC/90502-					
4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000629	MN -102	12:49251
DOE/PC/90519-					
T3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014640	MN -102	12:49252
DOE/PC/90526-					
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000064	MN -102	12:49253
DOE/PC/90908-					
T2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000390	MN -108	12:49241
T3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000391	MN -108	12:49242
DOE/PC/90909-					
T4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013718	MN -108	12:49243
DOE/PC/90912-					
T4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013630	MN -108	12:49244
DOE/PC/91404-					
T4	NTIS, PC A16/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014904	MN -101	12:49268
DOE/RL/10336-					
1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000444	MN -60	12:49503
DOE/RW-					
0035/ 1-Vol.1-Rev.1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE87012644	MN -70	12:49463
0035/ 1-Vol.2	NTIS, PC A99/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012645	MN -70	12:49461
0035/ 1-Vol.3-Rev.1	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012646	MN -70	12:49464
DP-MS-					
86-186	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014833	MN -70B	12:49386
86-200	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012943	MN -25	12:49952
87-23	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014200	MN -70	12:49387
87-34	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87010201	MN -70	12:49388
87-47	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014436	MN -70B	12:49389
87-60	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014831	MN -70B	12:49390
87-78	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014439	MN -70B	12:49391
87-79	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014195	MN -70B	12:49392
87-81	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014196	MN -70B	12:49393
87-95	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014435	MN -70B	12:49394
87-103	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014842	MN -32	12:51031
DPSP-					
87-1115-Rev.	NTIS, PC A11; 3		DE87014438	MN -11	12:50245
ECN-					
198	NTIS (US Sales Only), PC A09/MF A01		DE87703404	MN -25	12:49822
EGG-M-					
15687	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014881	MN -114	12:49867
18587	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014872	MN -78	12:49713
EGG-SPAG-					
7682	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012426	MN -32	12:51002
EGG-WT-					
7774	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014986	MN -11	12:50247
EIR-					
622	NTIS (US Sales Only), PC A03/MF A01		DE87703405	MN -51	12:50234
EML-					
462	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013828	MN -11	12:50193
ENDF-					
324-Vol.3	*See* LA-9303-M-Vol.3	E 1.99:	DE88000356	MN -2	12:50513
EPA-					
450/ 3-87/ 009	*See* PB-87-203766/XAB				12:50198
450/ 5-86/ 13	*See* PB-87-200259/XAB				12:50226
520/ 1-86/ 009	*See* PB-87-207569/XAB				12:49445
520/ 1-86/ 011	*See* PB-87-210092/XAB				12:49446
600/ 8-87/ 014	*See* PB-87-210738/XAB				12:50204
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600/ 8-87/ 033	*See* PB-87-210753/XAB				12:50206
600/ D-87/ 147-S	*See* PB-87-208336/XAB				12:50200
600/ D-87/ 234	*See* PB-87-212775/XAB				12:50207

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600/ J-87/ 050	*See* PB-87-212445/XAB			12:50260
EPA/ROD/R-				
02-86/ 028	*See* PB-87-188488/XAB			12:50242
02-86/ 034	*See* PB-87-189353/XAB			12:50254
03-86/ 027	*See* PB-87-189031/XAB			12:50224
04-86/ 011	*See* PB-87-190088/XAB			12:50255
EPRI-AP-				
5385	Research Reports Center, Box 50490, Palo Alto, CA 940303	TI88920020	ND -97e	12:49478
5391	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920013	ND -105	12:49522
EPRI-CS-				
5196	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920024	ND -105	12:50194
5362-Vol.1	NTIS, PC A18/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303; 1 (GPO Dep.)	E 1.99: DE88000539	MN -107	12:49257
5362-Vol.2	NTIS, PC A20 - Research Reports Center, Box 50490, Palo Alto, CA 94303; 3	DE88000540	MN -107	12:49258
5386	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920023	ND -105	12:49523
5426	Research Repts. Ctr., Box 50490, Palo Alto, CA 94303	TI88920022	ND -107	12:50241
EPRI-EL-				
5242	Research Reports Center, Box 50490, Palo Alto, CA	TI87920583	ND -32	12:51032
5472-CCM-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920029	ND -132	12:49299
EPRI-EM-				
5398	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920009	ND -95d	12:49770
EPRI-NP-				
4574-CCM-Pt.2-Ch.8	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920026	ND -78	12:49541
5380-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920031	ND -80	12:49626
5380-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920032	ND -80	12:49627
5380-Vol.3	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920033	ND -80	12:49628
5388M	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920021	ND -78	12:49534
5410	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920025	ND -80	12:49629
EPRI-P-				
5417	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI88920002	ND -98	12:49747
ETSU-N-				
104	NTIS (US Sales Only), PC A04/MF A01; 1	DE88750204	MN -110	12:49755
EUR-				
10813-EN	Commission of the European Communities, Luxembourg. Office of Official Publications of the European Communities		ND -97	12:49526
EUR-CEA-FC-				
1276-Vol.1	NTIS (US Sales Only), PC A12/MF A01	DE87752817	MN -20b	12:50940
1276-Vol.2	NTIS (US Sales Only), PC A13/MF A01	DE87752818	MN -20d	12:50941
1276-Vol.3	NTIS (US Sales Only), PC A10/MF A01	DE87752804	MN -20b	12:50942
FNAL/C-				
87/ 139	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000734	MN -32	12:51003
FNAL-TM-				
1467	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000697	STD -28	12:50079
FRCEA-TH-				
34	NTIS (US Sales Only), PC A09/MF A01; 1	DE88750072	MN -38	12:50017
FRNC-TH-				
2495	NTIS (US Sales Only), PC A14/MF A01; 1	DE88750074	MN -38	12:50018
FSRN-SE-				
346	*See* PB-87-206207/XAB			12:50199
FSU-SCRU-				
87-08	*See* CONF-870249-10	E 1.99: DE87013900	MN -32	12:50403
GEND-				
062	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000445	STD -78	12:49670
HBC/REF-				
86-178	*See* PB-87-212494/XAB			12:49787
HEDL-SA-				
3555-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87014362	MN -41	12:49395
3721-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87014383	MN -38	12:50019
IAE-				
0011	*See* CNIC-00017	DE87703385	MN -48	12:50293
0012	*See* CNIC-00018	DE87703386	MN -4	12:49984
0013	*See* CNIC-00019	DE87703387	MN -28	12:50098
0014	*See* CNIC-00020	DE87703388	MN -46	12:50717
0016	*See* CNIC-00054	DE87703401	MN -34A	12:50828
IAEA-HPRA-				
13	NTIS (US Sales Only), PC A11/MF A01	DE87703406	MN -41	12:49448
IAEA-INFCIRC-				
1-Rev.8	NTIS (US Sales Only), PC A05/MF A01	DE87703407	MN -2	12:50987

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9-Rev.2-Add.6	NTIS (US Sales Only), PC A02/MF A01	DE87703408	MN -2	12:51044
335-Add.1	NTIS (US Sales Only), PC A02/MF A01	DE87703409	MN -2	12:51045
336-Add.2	*See* IAEA-INFCIRC-335-Add.1	DE87703409	MN -2	12:51045
IAEA-RL-				
142	NTIS (US Sales Only), PC A02/MF A01	DE87703410	MN -4	12:49912
146	NTIS (US Sales Only), PC A02/MF A01	DE88700112	MN -4	12:49913
IAEA-TECDOC-				
410	NTIS (US Sales Only), PC A19/MF A01	DE87703411	MN -23	12:49469
417	NTIS (US Sales Only), PC A11/MF A01	DE87703681	MN -20	12:50947
419	NTIS (US Sales Only), PC A08/MF A01	DE88700115	MN -86	12:49336
420	NTIS (US Sales Only), PC A13/MF A01	DE88700116	MN -86	12:49306
IFSR-				
298	*See* DOE/ET/53088-298	E 1.99: DE88000305	MN -20	12:50878
299	*See* DOE/ET/53088-299	E 1.99: DE88000306	MN -20	12:51001
300	*See* DOE/ET/53088-300	E 1.99: DE88000307	MN -20g	12:50879
IFT-P-				
07/ 86	NTIS (US Sales Only), PC A02/MF A01	DE87703412	MN -34D	12:50483
08/ 86	*See* IFUSP-P-585	DE87703427	MN -34D	12:50484
12/ 86	*See* CBPF-NF-042/86	DE87703368	MN -34D	12:50835
IFUSP-P-				
550	NTIS (US Sales Only), PC A02/MF A01	DE87703413	MN -34D	12:50434
565	NTIS (US Sales Only), PC A02/MF A01	DE87703414	MN -20	12:50880
566	NTIS (US Sales Only), PC A02/MF A01	DE87703415	MN -34C	12:50597
567	NTIS (US Sales Only), PC A02/MF A01	DE87703416	MN -34B	12:50188
568	NTIS (US Sales Only), PC A02/MF A01	DE87703417	MN -34C	12:50598
569	NTIS (US Sales Only), PC A02/MF A01	DE87703418	MN -34C	12:50599
571	NTIS (US Sales Only), PC A02/MF A01	DE87703419	MN -34C	12:50600
572	NTIS (US Sales Only), PC A02/MF A01	DE87703420	MN -34B	12:50189
573	NTIS (US Sales Only), PC A02/MF A01	DE87703421	MN -34C	12:50601
574	NTIS (US Sales Only), PC A02/MF A01	DE87703422	MN -34D	12:50837
577	NTIS (US Sales Only), PC A02/MF A01	DE87703423	MN -34D	12:50838
580	NTIS (US Sales Only), PC A02/MF A01	DE87703424	MN -34C	12:50602
581	NTIS (US Sales Only), PC A02/MF A01	DE87703425	MN -34C	12:50603
583	NTIS (US Sales Only), PC A04/MF A01	DE87703426	MN -34C	12:50604
585	NTIS (US Sales Only), PC A02/MF A01	DE87703427	MN -34D	12:50484
587	NTIS (US Sales Only), PC A02/MF A01	DE87703428	MN -34C	12:50605
588	NTIS (US Sales Only), PC A02/MF A01	DE87703429	MN -34D	12:50435
591	NTIS (US Sales Only), PC A02/MF A01	DE87703430	MN -34C	12:50606
595	NTIS (US Sales Only), PC A02/MF A01	DE87703431	MN -34C	12:50607
615	NTIS (US Sales Only), PC A02/MF A01	DE87703432	MN -34C	12:50608
620	NTIS (US Sales Only), PC A02/MF A01	DE87703433	MN -34C	12:50537
INDC(NDS)-				
190/ G-F-R	NTIS (US Sales Only), PC A03/MF A01	DE87703434	MN -34C	12:50507
INIS-BR-				
675	NTIS (US Sales Only), PC A02/MF A01	DE87703435	MN -20	12:50881
676	NTIS (US Sales Only), PC A06/MF A01	DE87703436	MN -4	12:49882
677	NTIS (US Sales Only), PC A02/MF A01	DE87703437	MN -86	12:49351
678	NTIS (US Sales Only), PC A13/MF A01	DE87703438	MN -48	12:50291
679	NTIS (US Sales Only), PC A07/MF A01	DE87703439	MN -4	12:50333
680	NTIS (US Sales Only), PC A04/MF A01	DE87703440	MN -4	12:50248
681	NTIS (US Sales Only), PC A06/MF A01	DE87703441	MN -37	12:50580
682	NTIS (US Sales Only), PC A06/MF A01	DE87703442	MN -37	12:50581
683	NTIS (US Sales Only), PC A05/MF A01	DE87703443	MN -20	12:50882
684	NTIS (US Sales Only), PC A07/MF A01	DE87703444	MN -37	12:50582
685	NTIS (US Sales Only), PC A05/MF A01	DE87703445	MN -37	12:50134
686	NTIS (US Sales Only), PC A05/MF A01	DE87703446	MN -37	12:50135
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688	NTIS (US Sales Only), PC A13/MF A01	DE87703448	MN -34C	12:50609
689	NTIS (US Sales Only), PC A08/MF A01	DE87703449	MN -34A	12:50722
690	NTIS (US Sales Only), PC A08/MF A01	DE87703450	MN -37	12:50140
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693	NTIS (US Sales Only), PC A04/MF A01	DE87703453	MN -37	12:50142
696	NTIS (US Sales Only), PC A05/MF A01	DE87703456	MN -4	12:49921
697	NTIS (US Sales Only), PC A02/MF A01	DE87703457	MN -25	12:49824
698	NTIS (US Sales Only), PC A02/MF A01	DE87703458	MN -25	12:49825
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714	NTIS (US Sales Only), PC A14/MF A01	DE87703466	MN -34C	12:50627
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735	NTIS (US Sales Only), PC A02/MF A01	DE87703487	MN -80	12:49620
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738	NTIS (US Sales Only), PC A02/MF A01	DE87703490	MN -48	12:50296
739	NTIS (US Sales Only), PC A02/MF A01	DE87703491	MN -48	12:50288
740	NTIS (US Sales Only), PC A02/MF A01	DE87703492	MN -4	12:49929
741	NTIS (US Sales Only), PC A02/MF A01	DE87703493	MN -22	12:49293
742	NTIS (US Sales Only), PC A02/MF A01	DE87703494	MN -4	12:49930

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743	NTIS (US Sales Only), PC A02/MF A01	DE87703495	MN -4	12:49931
744	NTIS (US Sales Only), PC A02/MF A01	DE87703496	MN -37	12:49932
745	NTIS (US Sales Only), PC A02/MF A01	DE87703497	MN -4	12:49983
746	NTIS (US Sales Only), PC A17/MF A01	DE87703498	MN -34C	12:50632
747	NTIS (US Sales Only), PC A02/MF A01	DE87703499	MN -4	12:50315
749	NTIS (US Sales Only), PC A02/MF A01	DE87703500	MN -25	12:49869
752	NTIS (US Sales Only), PC A02/MF A01	DE87703699	MN -11	12:50316
753	NTIS (US Sales Only), PC A02/MF A01	DE87703503	MN -4	12:50317
755	NTIS (US Sales Only), PC A02/MF A01	DE87703505	MN -25	12:49829
756	NTIS (US Sales Only), PC A02/MF A01	DE87703506	MN -25	12:49830
757	NTIS (US Sales Only), PC A02/MF A01	DE87703507	MN -25	12:49831
758	NTIS (US Sales Only), PC A02/MF A01	DE87703508	MN -25	12:49832
759	NTIS (US Sales Only), PC A02/MF A01	DE87703509	MN -80	12:49686
760	NTIS (US Sales Only), PC A02/MF A01	DE87703700	MN -25	12:49833
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762	NTIS (US Sales Only), PC A02/MF A01	DE87703511	MN -86	12:49317
763	NTIS (US Sales Only), PC A02/MF A01	DE87703701	MN -25	12:49883
765	NTIS (US Sales Only), PC A02/MF A01	DE87703513	MN -86	12:49318
766	NTIS (US Sales Only), PC A02/MF A01	DE87703514	MN -86	12:49319
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770	NTIS (US Sales Only), PC A02/MF A01	DE87703518	MN -86	12:49321
771	NTIS (US Sales Only), PC A02/MF A01	DE87703519	MN -22	12:49467
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773	NTIS (US Sales Only), PC A02/MF A01	DE87703521	MN -86	12:49323
774	NTIS (US Sales Only), PC A02/MF A01	DE87703522	MN -86	12:49324
775	NTIS (US Sales Only), PC A02/MF A01	DE87703523	MN -86	12:49325
776	NTIS (US Sales Only), PC A02/MF A01	DE87703702	MN -4	12:49954
777	NTIS (US Sales Only), PC A02/MF A01	DE87703524	MN -4	12:49955
778	NTIS (US Sales Only), PC A02/MF A01	DE87703525	MN -4	12:49956
779	NTIS (US Sales Only), PC A02/MF A01	DE87703526	MN -80	12:49630
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782	NTIS (US Sales Only), PC A02/MF A01	DE87703528	MN -80	12:49631
783	NTIS (US Sales Only), PC A02/MF A01	DE87703529	MN -80	12:49714
784	NTIS (US Sales Only), PC A02/MF A01	DE87703530	MN -25	12:49835
787	NTIS (US Sales Only), PC A02/MF A01	DE87703532	MN -78	12:49715
788	NTIS (US Sales Only), PC A02/MF A01	DE87703704	MN -78	12:49545
789	NTIS (US Sales Only), PC A02/MF A01	DE87703533	MN -80	12:49657
793	NTIS (US Sales Only), PC A02/MF A01	DE87703536	MN -78	12:49716
794	NTIS (US Sales Only), PC A02/MF A01	DE87703537	MN -41	12:50697
797	NTIS (US Sales Only), PC A02/MF A01	DE87703540	MN -4	12:49986
798	NTIS (US Sales Only), PC A02/MF A01	DE87703541	MN -37	12:50148
799	NTIS (US Sales Only), PC A02/MF A01	DE87703542	MN -25	12:50149
800	NTIS (US Sales Only), PC A02/MF A01	DE87703543	MN -23	12:50702
802	NTIS (US Sales Only), PC A02/MF A01	DE87703545	MN -25	12:49836
803	NTIS (US Sales Only), PC A02/MF A01	DE87703706	MN -25	12:49837
804	NTIS (US Sales Only), PC A02/MF A01	DE87703546	MN -25	12:49838
805	NTIS (US Sales Only), PC A02/MF A01	DE87703547	MN -25	12:49839
806	NTIS (US Sales Only), PC A02/MF A01	DE87703548	MN -25	12:49840
807	NTIS (US Sales Only), PC A02/MF A01	DE87703707	MN -25	12:49841
808	NTIS (US Sales Only), PC A02/MF A01	DE87703549	MN -25	12:49842
811	NTIS (US Sales Only), PC A02/MF A01	DE87703709	MN -25	12:49843
819	NTIS (US Sales Only), PC A02/MF A01	DE87703717	MN -41	12:49546
821	NTIS (US Sales Only), PC A02/MF A01	DE87703718	MN -25	12:49871
822	NTIS (US Sales Only), PC A02/MF A01	DE87703719	MN -23	12:50286
823	NTIS (US Sales Only), PC A02/MF A01	DE87703720	MN -23	12:50287
824	NTIS (US Sales Only), PC A02/MF A01	DE87703721	MN -37	12:50334
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827	NTIS (US Sales Only), PC A02/MF A01	DE87703723	MN -86	12:49326
829	NTIS (US Sales Only), PC A02/MF A01	DE87703725	MN -78	12:49547
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831	NTIS (US Sales Only), PC A02/MF A01	DE87703727	MN -2	12:49616
832	NTIS (US Sales Only), PC A02/MF A01	DE87703728	MN -4	12:49935
834	NTIS (US Sales Only), PC A02/MF A01	DE87703730	MN -41	12:50703
835	NTIS (US Sales Only), PC A02/MF A01	DE87703731	MN -37	12:50150
836	NTIS (US Sales Only), PC A02/MF A01	DE87703732	MN -37	12:50151
837	NTIS (US Sales Only), PC A07/MF A01	DE87703733	MN -34C	12:50642
838	NTIS (US Sales Only), PC A05/MF A01	DE87703734	MN -34C	12:50511
845	NTIS (US Sales Only), PC A02/MF A01	DE88700024	MN -4	12:50318
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853	NTIS (US Sales Only), PC A02/MF A01	DE87703746	MN -86	12:49327
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857	NTIS (US Sales Only), PC A03/MF A01	DE87703750	MN -4	12:49936
858	NTIS (US Sales Only), PC A02/MF A01	DE88700027	MN -4	12:49958

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861	NTIS (US Sales Only), PC A02/MF A01	DE87703753	MN -86	12:49331
862	NTIS (US Sales Only), PC A02/MF A01	DE87703754	MN -86	12:49332
863	NTIS (US Sales Only), PC A02/MF A01	DE87703755	MN -4	12:49938
864	NTIS (US Sales Only), PC A02/MF A01	DE87703756	MN -4	12:49959
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10683	NTIS (US Sales Only), PC A11/MF A01	DE87752883	MN -13	12:51046
10688	NTIS (US Sales Only), PC A05/MF A01	DE87752880	MN -20f	12:50884
10694	NTIS (US Sales Only), PC A08/MF A01	DE87752881	MN -25	12:49844
10697	NTIS (US Sales Only), PC A08/MF A01	DE87752884	MN -37	12:50163
10700	NTIS (US Sales Only), PC A08/MF A01	DE87752885	MN -4	12:49987
10701	NTIS (US Sales Only), PC A08/MF A01	DE87752886	MN -4	12:49988
10703	NTIS (US Sales Only), PC A07/MF A01	DE87752887	MN -48	12:50297
10704	NTIS (US Sales Only), PC A04/MF A01	DE87752888	MN -48	12:50298
10707	NTIS (US Sales Only), PC A20/MF A01	DE87752889	MN -11	12:50332
10940	NTIS (US Sales Only), PC A02/MF A01	DE88700028	MN -41	12:49717
10941	NTIS (US Sales Only), PC A02/MF A01	DE88700029	MN -41	12:49718
10942	NTIS (US Sales Only), PC A02/MF A01	DE88700030	MN -41	12:49719
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10944	NTIS (US Sales Only), PC A03/MF A01	DE88700118	MN -41	12:49721
10945	NTIS (US Sales Only), PC A05/MF A01	DE88700032	MN -41	12:49722
10952	NTIS (US Sales Only), PC A02/MF A01	DE87703552	MN -22	12:49468
10953	NTIS (US Sales Only), PC A02/MF A01	DE87703553	MN -23	12:49472
10954	NTIS (US Sales Only), PC A03/MF A01	DE87703554	MN -4	12:49939
10958	NTIS (US Sales Only), PC A12/MF A01	DE87703555	MN -80	12:49658
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10964	NTIS (US Sales Only), PC A03/MF A01	DE87703561	MN -48	12:50276
10971	NTIS (US Sales Only), PC A16/MF A01	DE87703562	MN -20	12:50885
10988	NTIS (US Sales Only), PC A03/MF A01	DE87703574	MN -78	12:49723
10992	NTIS (US Sales Only), PC A03/MF A01	DE87703577	MN -48	12:50221
10994	NTIS (US Sales Only), PC A99/MF A01	DE87703762	MN -80	12:49531
10998	NTIS (US Sales Only), PC A03/MF A01	DE88700209	MN -34A	12:50734
11033	NTIS (US Sales Only), PC A03/MF A01	DE88700238	MN -48	12:50281
IPPJ-REV-				
2	NTIS (US Sales Only), PC A16/MF A01	DE87780166	MN -20	12:50864
IRI-				
132-82-05	NTIS (US Sales Only), PC A02/MF A01	DE87703599	MN -34A	12:50752
IS-				
4919	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE88000656	MN -102	12:49231
4926	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE88000658	MN -102	12:49232
4927	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000659	MN -102	12:49233
4928	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000660	MN -102	12:49234
4929	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000661	MN -102	12:49235
4930	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000716	MN -102	12:49236
4931	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000662	MN -102	12:49237
4932	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000663	MN -102	12:49254
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25	NTIS (US Sales Only), PC A09/MF A01	DE88700057	MN -80	12:49641
IWGFR-				
56	NTIS (US Sales Only), PC A08/MF A01	DE87703766	MN -79	12:49585
60	NTIS (US Sales Only), PC A08/MF A01	DE87703767	MN -79	12:49598
JAERI-M-				
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86-189	NTIS (US Sales Only), PC A14/MF A01	DE88780007	MN -20d	12:50976
86-191	NTIS (US Sales Only), PC A05/MF A01	DE87703613	MN -80	12:49690
86-193	NTIS (US Sales Only), PC A02/MF A01	DE87703614	MN -46	12:50694
86-194	NTIS (US Sales Only), PC A02/MF A01	DE87703615	MN -20	12:50915
86-195	NTIS (US Sales Only), PC A09/MF A01	DE87703616	MN -78	12:49568
86-196	NTIS (US Sales Only), PC A06/MF A01	DE87703617	MN -78	12:49569
86-197	NTIS (US Sales Only), PC A04/MF A01	DE87703618	MN -78	12:49539
86-199	NTIS (US Sales Only), PC A03/MF A01	DE87703619	MN -78	12:49570
87-001	NTIS (US Sales Only), PC A05/MF A01	DE87703620	MN -78	12:49571
87-004	NTIS (US Sales Only), PC A02/MF A01	DE87703621	MN -20	12:50916
87-006	NTIS (US Sales Only), PC A02/MF A01	DE87703622	MN -80	12:49691
87-008	NTIS (US Sales Only), PC A03/MF A01	DE87703623	MN -20	12:50917
87-011	NTIS (US Sales Only), PC A03/MF A01	DE87703624	MN -20	12:50918
87-014	NTIS (US Sales Only), PC A03/MF A01	DE87703625	MN -20	12:50919
JINR-				
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R-11-86-329	NTIS (US Sales Only), PC A02/MF A01	DE87703627	MN -34D	12:50847
K/PS-				
5076	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000647	MN -37	12:50175
K/SUB-				
85-22224/ 4	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE87012962	MN -11	12:49403
85-22224/ 6	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87012960	MN -11	12:49288
KFKI-				
1987-04/ G	NTIS (US Sales Only), PC A04/MF A01	DE87703628	MN -2	12:49612
1987-06/ G	NTIS (US Sales Only), PC A03/MF A01	DE87703629	MN -78	12:49572
1987-07/ G	NTIS (US Sales Only), PC A03/MF A01	DE87703630	MN -32	12:49692
1987-22/ G	NTIS (US Sales Only), PC A03/MF A01	DE88700267	MN -80	12:49623

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1987-28/ M	NTIS (US Sales Only), PC A02/MF A01		DE88700130	MN -78	12:49667
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282	NTIS (US Sales Only), PC A07/MF A01		DE88700062	MN -80	12:49694
283	NTIS (US Sales Only), PC A04/MF A01		DE87780169	MN -41	12:50709
284	NTIS (US Sales Only), PC A04/MF A01		DE87703631	MN -80	12:49695
KVI-					
85	Library KNAW, P.O. Box 19121, 1000 GC Amsterdam			ND -34C	12:50504
LA-					
9303-M-Vol.3	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000356	MN -.	12:50513
10945-M	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014997	MN -11	12:50335
11087-MS	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000166	MN -38	12:50021
LA-UR-					
86-4202	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000433	MN -34C	12:50668
87-1497-Final	NTIS, PC A02; 3		DE88000520	MN -32	12:51010
87-1916	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87011789	MN -70	12:49404
87-1991	NTIS, PC A02; 3		DE87011777	MN -25	12:49872
87-2105-Rev.	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87011756	MN -34	12:50400
87-2543	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87013172	MN -13	12:51011
87-2561	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013174	MN -38	12:50022
87-2611	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87014741	MN -34	12:49886
87-2682	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014731	MN -48	12:50257
87-2683	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014730	MN -48	12:50258
87-2774	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014771	MN -25	12:49887
87-2803	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014768	MN -34B	12:50920
87-2855	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014755	MN -70B	12:49405
87-2892	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014746	MN -34C	12:50669
87-2909	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000516	MN -34C	12:50670
87-2958	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000511	MN -32	12:51012
87-2961	NTIS, PC A02; 3		DE88000510	MN -38	12:50039
87-2977	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000507	MN -34B	12:50345
87-2981	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000505	MN -38	12:50040
87-3053	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000526	MN -34C	12:50519
87-3094	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000519	MN -34C	12:50671
87-3126	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000535	MN -34C	12:50672
87-3191	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000489	MN -34C	12:50528
87-3305	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000480	MN -37	12:50176
LALP-					
87-16	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000070	MN -66b	12:49498
LBL-					
22713	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000681	STD -28	12:50977
22750	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013955	STD -34	12:50921
22904	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000189	MN -4	12:49888
22985	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000477	MN -28	12:50099
23206	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014689	MN -32	12:50092
23455	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000648	MN -95d	12:49771
23495	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000649	STD -94c	12:49733
23575	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000464	MN -34D	12:50454
23733	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000190	MN -32	12:49406
23816	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000619	MN -34C	12:50520
23822	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014683	MN -38	12:50023
23823	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014684	MN -38	12:50024
23852	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000191	MN -25	12:49816
23921	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000461	MN -34D	12:50409
LBL-PUB-					
3067	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000212	MN -32	12:51042
LNCC-					
008/ 87	NTIS (US Sales Only), PC A02/MF A01		DE87703632	MN -80	12:49636
010/ 87	NTIS (US Sales Only), PC A02/MF A01		DE87703769	MN -80	12:49637
MBL-					
1986-7	NTIS (US Sales Only), PC A03/MF A01		DE87703633	MN -48	12:50302
1986-8	NTIS (US Sales Only), PC A03/MF A01		DE87703634	MN -48	12:50303
MF-					
116	*See* DOE/ER/53223-45	E 1.99:	DE88000202	MN -34A	12:50877
MIRA-					
87/ 01/ XAB	NTISPC$32.00				12:49814
87/ 03/ XAB	NTISPC$32.00				12:49812
MIRA/PR-K-					
3032/ 1-REV-1	*See* MIRA-87/03/XAB				12:49812
32126	*See* MIRA-87/01/XAB				12:49814
MLM-					
3455(OP)	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000729	MN -4	12:49945
NAGRA-NTB-					
83-01	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49407
83-04	Nagra, CH-5401 Baden, Switzerland			ND -11	12:50250
83-05	Nagra, CH-5401 Baden, Switzerland			ND -25	12:50060
83-06	Nagra, CH-5401 Baden, Switzerland			ND -51	12:50236
83-07	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49408
83-08	Nagra, CH-5401 Baden, Switzerland			ND -51	12:50326
83-10	Nagra, CH-5401 Baden, Switzerland			ND -51	12:50237
83-11	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49409
83-12	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49410
83-13	Nagra, CH-5401 Baden, Switzerland			ND -51	12:50238

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83-14	Nagra, CH-5401 Baden, Switzerland			ND -51	12:50325
83-15	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49411
83-15	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49412
83-16	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49413
84-50	Nagra, CH-5401 Baden, Switzerland			ND -11	12:50251
84-51	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49414
86-16	Nagra, CH-5401 Baden, Switzerland			ND -51	12:49672
86-28	Nagra, CH-5401 Baden, Switzerland			ND -70	12:49415
NBI-HE-					
86-41	NTIS (US Sales Only), PC A03/MF A01		DE87752900	MN -32	12:51013
86-42	NTIS (US Sales Only), PC A04/MF A01		DE87752895	MN -34D	12:50488
86-43	NTIS (US Sales Only), PC A02/MF A01		DE87752890	MN -34D	12:50410
86-45	NTIS (US Sales Only), PC A02/MF A01		DE87752897	MN -32	12:51014
86-46	NTIS (US Sales Only), PC A02/MF A01		DE87752898	MN -34D	12:50489
86-52	NTIS (US Sales Only), PC A02/MF A01		DE87752899	MN -32	12:51015
87-02	NTIS (US Sales Only), PC A02/MF A01		DE87752891	MN -34D	12:50490
87-04	NTIS (US Sales Only), PC A02/MF A01		DE87752893	MN -34D	12:50455
87-05	NTIS (US Sales Only), PC A02/MF A01		DE87752892	MN -34D	12:50456
87-06	NTIS (US Sales Only), PC A03/MF A01		DE87752896	MN -32	12:51016
87-07	NTIS (US Sales Only), PC A02/MF A01		DE87752894	MN -34D	12:50491
NEI-DK-					
33	NTIS (US Sales Only), PC A03/MF A01		DE87752877	MN -41	12:50222
34	NTIS (US Sales Only), PC A04/MF A01		DE87752879	MN -11	12:50239
NIIEFA-P-V-					
0709	NTIS (US Sales Only), PC A02/MF A01		DE87703635	MN -28	12:50093
NIKHEF-					
84	NTIS (US Sales Only), PC A06/MF A01		DE87703636	MN -34D	12:50405
85	NTIS (US Sales Only), PC A07/MF A01		DE87703637	MN -34D	12:50406
NIKHEF-H-					
87-1	NTIS (US Sales Only), PC A03/MF A01		DE87703638	MN -34D	12:50848
87-2	NTIS (US Sales Only), PC A02/MF A01		DE87703639	MN -34D	12:50411
87-4	NTIS (US Sales Only), PC A02/MF A01		DE88700275	MN -34D	12:50457
NIKHEF-K-					
83/ 84	NTIS (US Sales Only), PC A06/MF A01		DE87703640	MN -34C	12:50673
NMRDI-					
2-73-4226	NTIS, PC A07/MF A01 - New Mexico Research and Development Inst., 1220 South St., Francis Dr., Suite 358, Santa Fe, NM 87501; 1		DE88900026	MN -12	12:49513
2-74-4321	NTIS, PC A13/MF A01 - New Mexico Research and Development Institute, Pion Bldg., Suite 358, 1220 S. St., Francis Dr., Sante Fe, NM 87501; 1		DE88900021	MN -14	12:49255
NP-					
7752873	NTIS (US Sales Only), PC A02/MF A01; 1		DE87752873	MN -121	12:49282
7901001	US Fish and Wildlife Service, 1010 Gause Blvd., Slidell, LA 70458		TI87901001	MN -11	12:50243
8900020	New York Univ., Dept. of Economics, Washington Square, New York, NY, 10003		TI88900020	MN -98B	12:49286
NRL-MR-					
6061	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000272	MN -21	12:50980
NTIA-					
87-216	*See* PB-87-209326/XAB				12:49891
NUREG-					
0020-Vol.11-No.1	NTIS, PC A20/MF A01 - GPO		DE88900023	MN -80	12:49532
0750-Vol.25-Index.1	NTIS, PC A03 - GPO		TI88900024	MN -80	12:49613
1194	NTIS, PC A04/MF A01 - GPO		DE88900003	MN -80	12:49614
1278	NTIS, PC A03/MF A01 - GPO		DE88900004	MN -78	12:49615
NUREG/CR-					
2452	NTIS, PC A06/MF A01 - GPO		DE87013631	MN -70	12:49416
4219-Vol.4-No.1	NTIS, PC A12/MF A01 - GPO		DE87012678	MN -78	12:49540
4534	NTIS, PC A05/MF A01 - GPO		DE87014984	MN -80	12:49725
4590-Vol.2	NTIS, PC A04/MF A01 - GPO		DE87014211	MN -80	12:49638
4654	NTIS, PC A09/MF A01 - GPO		DE87900916	MN -70	12:49417
4808	NTIS, PC A08/MF A01 - GPO		DE87013782	MN -70	12:50336
4846	NTIS, PC A08		TI87013783	MN -70	12:49418
4865	NTIS, PC A02/MF A01 - GPO		DE87013034	MN -70	12:49419
4951	NTIS, PC A06/MF A01 - GPO		DE87900991	MN -41	12:50304
4981	NTIS, PC A03/MF A01 - GPO		DE88000046	MN -80	12:49726
NYSERDA-					
87-9	New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223		TI87900986	MN -95d	12:49772
ORNL-					
5567/ R1	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014966	MN -70	12:49420
6335	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014637	MN -20	12:50922
6374	*See* NUREG/CR-4865		DE87013034	MN -70	12:49419
6386	NTIS, PC A14/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014955	MN -70	12:49421
6392	NTIS, PC A10; 3		DE88000184	MN -11	12:50313
6405/ R3	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014965	MN -11	12:49741
ORNL/CON-					
219	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014974	MN -95d	12:49773
228/ P3	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014973	MN -95d	12:49774
234	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014975	MN -95d	12:49775
ORNL/M-					
387	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012923	MN -11	12:49422

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388	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87014932	MN -11	12:50223
425	*See* DOE/ER-0333	E 1.99: DE88000347	MN -20	12:50875
ORNL/Sub-				
85-27453/ 1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87014969	MN -95d	12:49776
86-07685/ 1	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87014972	MN -70B	12:49423
86-27470/ 1	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87014971	STD -94a	12:49731
ORNL/TM-				
9593-Vol.4-No.1	*See* NUREG/CR-4219-Vol.4-No.1	DE87012678	MN -78	12:49540
10233	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87013365	STD -70B	12:49424
10255	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE88000043	MN -41	12:49451
10410	NTIS, PC A03; 3	DE87013369	MN -32	12:51017
10441	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE88000024	MN -48	12:50282
10478	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE88000019	MN -11	12:50196
10499	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE88000004	MN -70B	12:49425
10566	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE88000145	MN -70A	12:49426
OTH-				
86-212	H.M. Stationery Office, London		ND -122	12:49278
86-231	H.M. Stationery Office, London		ND -122	12:49292
PAPO-				
87-101-MASTERINDEX	Performance Assurance Project Office-ORNL, Box Y, Oak Ridge, TN 37831	TI88000621	ND -80	12:49744
PATENTS-US-	(US: Commissioner of Patents, Washington, DC 20231, USA, $1.50 per copy.)			
4,648,950				12:49905
4,686,368				12:50167
4,686,443				12:49737
4,686,833				12:49971
4,687,165				12:50036
4,687,560				12:49972
4,687,570				12:49247
4,687,598				12:49735
4,687,616				12:50982
4,687,617				12:50929
4,687,717				12:49736
4,687,880				12:49490
4,687,987				12:50396
4,687,990				12:50071
4,688,068				12:49489
A 6-003,523		E 1.99: DE88000857	MN -69	12:49809
A 6-941,130		E 1.99: DE88000850	MN -101	12:49248
PB-				
87-188488/ XAB	NTIS, PC A05/MF A01			12:50242
87-189031/ XAB	NTIS, PC A02/MF A01			12:50224
87-189353/ XAB	NTIS, PC A04/MF A01			12:50254
87-190088/ XAB	NTIS, PC A03/MF A01			12:50255
87-194288/ XAB	NTIS, PC A17/MF A01			12:50003
87-196507/ XAB	NTIS, PC A03/MF A01			12:49524
87-200259/ XAB	NTIS, PC A05/MF A01			12:50226
87-201950/ XAB	NTIS, PC A14/MF A01			12:49815
87-203535/ XAB	NTIS PC PC E04/MF E01			12:50197
87-203766/ XAB	NTIS, PC A05/MF A01			12:50198
87-204459/ XAB	NTIS, PC A08/MF A01			12:49889
87-204467/ XAB	NTIS, PC A08/MF A01			12:49890
87-205449/ XAB	NTIS PC PC E04/MF E04			12:49279
87-206207/ XAB	NTIS, PC A02/MF A01			12:50199
87-206827/ XAB	NTIS, PC A06/MF A01			12:49280
87-207254/ XAB	NTIS, PC A15/MF A01			12:49289
87-207262/ XAB	NTIS, PC A08/MF A01			12:49290
87-207569/ XAB	NTIS, PC A11/MF A01			12:49445
87-208336/ XAB	NTIS, PC A02/MF A01			12:50200
87-208427/ XAB	NTIS, PC A99/MF E06			12:49742
87-208468/ XAB	NTIS, PC A07/MF A01			12:49786
87-208872/ XAB	NTIS, PC A07/MF A01			12:50201
87-209326/ XAB	NTIS, PC A06/MF A01			12:49891
87-209466/ XAB	NTIS, PC A04/MF A01			12:49808
87-209573/ XAB	NTIS, PC A09/MF A01			12:50244
87-209607/ XAB	NTIS, PC A03/MF A01			12:49743
87-209649/ XAB	NTIS, PC A17/MF A01			12:49291
87-209995/ XAB	NTIS, PC A06/MF A01			12:49892
87-210092/ XAB	NTIS, PC A03/MF A01			12:49446
87-210308/ XAB	NTIS, PC A04/MF A01			12:49893
87-210357/ XAB	NTIS PC PC E07/MF E01			12:50246
87-210423/ XAB	NTIS PC PC E05/MF E01			12:49486
87-210464/ XAB	NTIS PC PC E04/MF A01			12:49494
87-210712/ XAB	NTIS PC PC E99			12:50202
87-210720/ XAB	NTIS, PC A03/MF A01			12:50203
87-210738/ XAB	NTIS, PC A14/MF A01			12:50204
87-210746/ XAB	NTIS, PC A04/MF A01			12:50205
87-210753/ XAB	NTIS, PC A02/MF A01			12:50206
87-211934/ XAB	NTIS, PC A06/MF A01			12:49301
87-212353/ XAB	NTIS, PC A07/MF A01			12:50229
87-212445/ XAB	NTIS, PC A02/MF A01			12:50260
87-212494/ XAB	NTIS, PC A08/MF A01			12:49787

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87-212668/ XAB	NTIS, PC A02/MF A01				12:50230
87-212775/ XAB	NTIS, PC A03/MF A01				12:50207
87-213070/ XAB	NTIS, PC A04/MF A01				12:49788
87-213534/ XAB	NTIS, PC A03/MF A01				12:50208
87-214342/ XAB	NTIS, PC A04/MF A01				12:50231
87-214359/ XAB	NTIS, PC A24/MF A01				12:50232
87-214656/ XAB	NTIS, PC A11/MF A01				12:49789
87-216966/ XAB	NTIS, PC A05/MF A01				12:49790
87-222725/ XAB	NTIS, PC A99/MF E04				12:49297
PITHA-					
87-10	NTIS (US Sales Only), PC A02/MF A01; 1		DE88900061	MN -34D	12:50412
PNL-					
3594-Rev.7	NTIS, PC A11; 3		DE87010253	MN -70	12:49462
5832-Vol.2	*See* NUREG/CR-4590-Vol.2		DE87014211	MN -80	12:49638
6106	*See* NUREG/CR-4808		DE87013782	MN -70	12:50336
6248	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000249	MN -60	12:49508
6259	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014273	MN -70	12:49427
6273	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000914	MN -85	12:49356
6274	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000546	MN -32	12:51018
6276	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE88000547	MN -32	12:51019
6292	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE87013867	MN -11	12:50209
6293	*See* DOE/RL/10336-1	E 1.99:	DE88000444	MN -60	12:49503
6309	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014826	MN -11	12:50252
6310	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014825	MN -11	12:50253
PNL-SA-					
14282	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000097	MN -97b	12:49527
14517	NTIS, PC A02; 3		DE88000098	MN -60	12:49509
14674	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000093	MN -38	12:50004
14920	NTIS, PC A02; 3		DE88000096	MN -38	12:50078
14953	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012167	MN -11	12:50227
15011	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000088	MN -95d	12:49777
15085	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000085	MN -102	12:49245
15089	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000082	MN -95d	12:49778
15090	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000092	MN -108	12:49246
PPPL-					
2455	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000119	STD -20d	12:50923
2456	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000118	STD -20g	12:50360
PUC-TN-					
01/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703641	MN -34A	12:50812
03/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703642	MN -34A	12:50813
04/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703643	MN -34D	12:50849
05/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703644	MN -34A	12:50381
06/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703645	MN -34A	12:50814
07/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703646	MN -34A	12:50382
09/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703647	MN -34A	12:50815
10/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703648	MN -34A	12:50816
19/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703649	MN -34D	12:50492
20/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703650	MN -34A	12:50817
21/ 84	NTIS (US Sales Only), PC A02/MF A01		DE87703651	MN -34D	12:50473
RERF-TR-					
15-85	NTIS (US Sales Only), PC A02/MF A01		DE87703652	MN -48	12:50306
22-84	NTIS (US Sales Only), PC A02/MF A01		DE87703653	MN -48	12:50307
RFP-					
4145	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012085	MN -11	12:50190
RHO-PB-SR-					
10-B-WM-Sep.86	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012653	MN -70	12:49428
RISO-M-					
2395	NTIS (US Sales Only), PC A02/MF A01		DE87752875	MN -23	12:50061
2396	NTIS (US Sales Only), PC A03/MF A01		DE87752876	MN -23	12:50062
RRK-					
86-45	NTIS (US Sales Only), PC A02/MF A01		DE87703654	MN -34D	12:50474
86-46	NTIS (US Sales Only), PC A03/MF A01		DE87703655	MN -34D	12:50493
86-47	NTIS (US Sales Only), PC A03/MF A01		DE87703656	MN -34B	12:50346
SAIC-					
85/ 1867	*See* AD-A-182563/7/XAB				12:50185
SAND-					
81-2573	*See* NUREG/CR-2452		DE87013631	MN -70	12:49416
85-1599	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000007	MN -70	12:49429
85-7102	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014271	MN -70	12:49430
86-0419	*See* NUREG/CR-4534		DE87014984	MN -80	12:49725
86-1130	NTIS PC E16/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014321	MN -71	12:49357
86-2480C	NTIS, PC A02; 3		DE88000394	MN -32	12:51020
86-7130	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014443	MN -70	12:49431
87-0060	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014309	STD -71	12:49358
87-0148C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013471	MN -38	12:50401
87-0160C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013446	MN -38	12:50031
87-0166C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013650	MN -38	12:50063
87-0454C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87010511	MN -32	12:51021
87-0642C	NTIS, PC A02; 3		DE87012360	MN -38	12:50032
87-0644C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013011	MN -34A	12:50383
87-0797	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000261	MN -25	12:49855
87-0819C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87013724	MN -80	12:49727
87-0838C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE88000431	MN -60	12:49510
87-0880	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014268	MN -70	12:49432

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87-0943C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013649	MN -78	12:49728
87-0967C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013723	MN -34	12:50818
87-0996C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87009048	MN -94c	12:49734
87-1001C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014157	MN -38	12:50068
87-1007C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013066	MN -38	12:50033
87-1131C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000604	MN -60	12:49511
87-1357C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87014102	MN -25	12:49996
87-1369C	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013811	MN -38	12:50064
87-1372C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87010518	MN -71	12:49359
87-1441C	NTIS, PC A02; 3		DE87013927	MN -38	12:50065
87-1443C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87014173	MN -38	12:49997
87-1444C	NTIS, PC A02; 3		DE87014193	MN -38	12:49998
87-1602C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87011321	MN -38	12:50069
87-1614C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87011305	MN -34	12:50850
87-1682C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87011281	MN -34A	12:50384
87-1707C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012874	MN -71	12:49360
87-1708C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013061	MN -71	12:49361
87-1775C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013064	MN -32	12:51022
87-1832C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013012	MN -34A	12:50819
87-1920C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013445	MN -71	12:49362
87-2135C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87014214	MN -63	12:49487
87-2320C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013715	MN -34A	12:50820
87-2363C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000360	MN -38	12:50034
87-7029	*See* NUREG/CR-4846		TI87013783	MN -70	12:49418
SEPRAD-					
07/ 86	NTIS (US Sales Only), PC A03/MF A01		DE87703657	MN -41	12:49673
SERI/SP-					
231-3126	NTIS, PC A14/MF A01; 1 (GPO Dep.)	E 1.99:	DE87012278	MN -61	12:49477
SERI/TP-					
255-3205	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE88001102	MN -62	12:49492
SI-					
86-13	NTIS (US Sales Only), PC A04/MF A01; 1		DE88900063	MN -37	12:50164
SINRE-					
0001	*See* CNIC-00011		DE87703382	MN -80	12:49640
0002	*See* CNIC-00012		DE87703383	MN -79	12:49579
0004	*See* CNIC-00014		DE87703384	MN -25	12:49819
SIP-					
0001	*See* CNIC-00022		DE87703389	MN -20	12:50866
0002	*See* CNIC-00023		DE87703390	MN -20	12:50867
0003	*See* CNIC-00024		DE87703391	MN -20	12:50931
0004	*See* CNIC-00025		DE87703392	MN -20	12:50868
0005	*See* CNIC-00026		DE87703393	MN -20	12:50869
0006	*See* CNIC-00027		DE87703394	MN -20	12:50870
0007	*See* CNIC-00028		DE87703395	MN -20	12:50871
0008	*See* CNIC-00029		DE87703396	MN -20	12:50872
0009	*See* CNIC-00030		DE87703397	MN -20	12:50932
0010	*See* CNIC-00031		DE87703398	MN -20	12:50933
0011	*See* CNIC-00032		DE87703399	MN -20	12:50873
0012	*See* CNIC-00033		DE87703400	MN -34A	12:50827
SLAC-PUB-					
4349	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87013586	MN -34D	12:50458
4353	NTIS, PC A02; 3		DE87014609	MN -34D	12:50494
4372	NTIS, PC A02; 3		DE88000699	MN -34D	12:50413
4409	NTIS, PC A02; 3		DE88000698	MN -34B	12:50347
STF-					
34-A87001	*See* PB-87-205449/XAB				12:49279
Technical memorandum-					
98	British Library Document Supply Centre, Boston Spa, Wetherby, West Yorks			ND -95e	12:49806
TN-					
2	*See* PB-87-203535/XAB				12:50197
TRB/NCTRP/SYN-					
10	*See* PB-87-216966/XAB				12:49790
TRB/TRR-					
1091	*See* PB-87-208468/XAB				12:49786
1102	*See* PB-87-213070/XAB				12:49788
TRI-PP-					
87-45	NTIS (US Sales Only), PC A02; 3		DE87900985	MN -34C	12:50674
87-47	NTIS (US Sales Only), PC A02/MF A01; 1		DE87900984	MN -34C	12:50535
87-55	NTIS (US Sales Only), PC A02/MF A01; 1		DE87900983	MN -34C	12:50475
TTC-					
0662	*See* SAND-86-1130	E 1.99:	DE87014321	MN -71	12:49357
0712	*See* SAND-87-0060	E 1.99:	DE87014309	STD -71	12:49358
0740	*See* SAND-87-1372C	E 1.99:	DE87010518	MN -71	12:49359
TVA/OP/EDT-					
87/ 13	NTIS, PC A11/MF A01; 1		DE88900012	MN -97d	12:49300
87/ 15	NTIS, PC A10/MF A01; 1		DE88900009	MN -95d	12:49779
87/ 16	NTIS, PC A05/MF A01; 1		DE88900010	MN -95d	12:49780
TVA/OP/PINFO-					
86/ 18	NTIS, PC A04/MF A01; 1		DE88900006	MN -98	12:49745
TVA/PUB-					
88/ 3	NTIS, PC A07/MF A01; 1		DE88900005	MN -98E	12:49746
UCB/ERL-M-					
87/ 52	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE88000415	MN -20	12:50924

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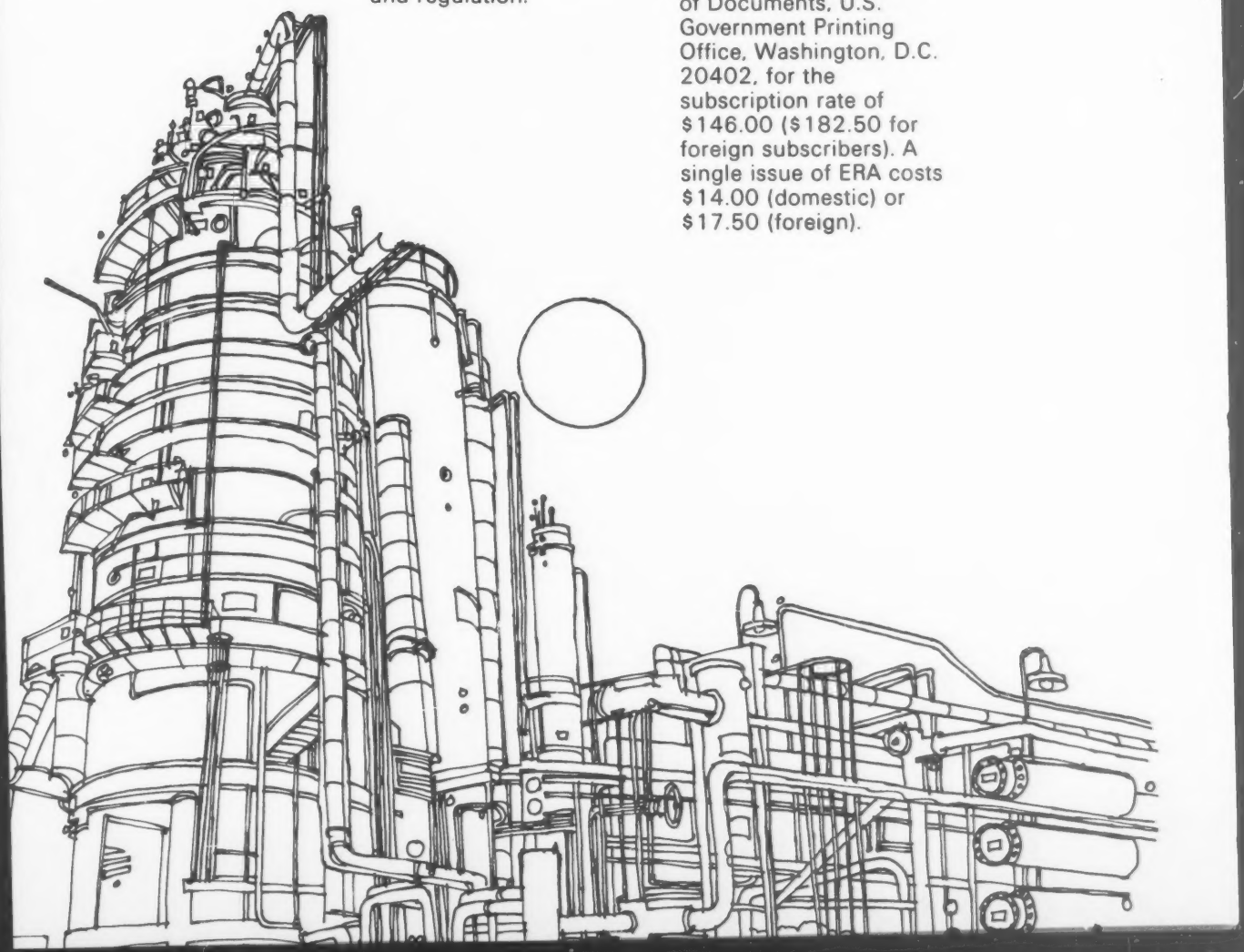

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